



AGRICULTURAL RESEARCH INSTITUTE

PUSA

---







TRANSACTIONS  
OF  
THE HIGHLAND AND AGRICULTURAL  
SOCIETY OF SCOTLAND

WITH

AN ABSTRACT OF THE PROCEEDINGS AT BOARD AND GENERAL  
MEETINGS, AND THE PREMIUMS OFFERED BY THE  
SOCIETY IN 1892

PUBLISHED ANNUALLY



FIFTH SERIE

VOL. IV.

313991  
JAN 1893

---

EDITED UNDER THE SUPERINTENDENCE OF FLETCHER NORTON MENZIES,  
SECRETARY TO THE SOCIETY

---

EDINBURGH:  
WILLIAM BLACKWOOD & SONS, 45 GEORGE STREET  
AND 37 PATERNOSTER ROW, LONDON

1892

# WORKS ON AGRICULTURE, &c.

## JOURNAL OF AGRICULTURE, AND TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

Second Series, 1828 to 1843, 21 vols., bound in cloth, £3, 3s.

Third Series, 1843 to 1865, 22 vols., bound in cloth, £4, 4s.

## INDEX TO THE FIRST, SECOND, AND THIRD SERIES OF THE TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND FROM 1799 TO 1865. Cloth, 5s.

## TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND. Fourth Series, 1866-71, 6 numbers, sewed, 4s. each; 1872-88, 17 volumes, cloth, 5s. each.

## INDEX TO THE FOURTH SERIES OF THE SOCIETY'S TRANS- ACTIONS FROM 1866 TO 1888, bound in cloth, 3s.

## TRANSACTIONS OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND. Fifth Series, 1889-92, 4 volumes, bound in cloth. 5s. each.

*The Transactions of the Society are issued free to Members on application  
to the Secretary for volumes published after application.*

## REPORT ON THE PRESENT STATE OF THE AGRICULTURE OF SCOTLAND, ARRANGED UNDER THE AUSPICES OF THE HIGHLAND AND AGRICULTURAL SOCIETY. Presented at the International Agricultural Congress at Paris in June 1878. Cloth, 5s. *Free to Members on application to the Secretary.*

## DICTIONARIUM SCOTO - CELTICUM: A DICTIONARY OF THE GAELIC LANGUAGE, in two volumes. Compiled and published under the direc- tion of the Highland Society of Scotland, 1828. Bound in cloth, £7, 7s.; 6 copies on extra paper, £10, 10s.

## PRACTICAL REMARKS ON AGRICULTURAL DRAINAGE. By WILLIAM W. HOZIER of Tannochside. Prize Report, published under the auspices of the Society, 1870. Cloth, 1s.

## HUMANITY TO ANIMALS, BEING EXTRACTS FROM PRIZE ESSAYS ON THE MOST EFFECTUAL METHOD OF INCULCATING THAT DUTY IN ELEMENTARY SCHOOLS. Published under the auspices of the Society. Sewed, 3d.

## HISTORY OF THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND, WITH NOTICES OF ANTERIOR SOCIETIES FOR THE PROMOTION OF AGRICULTURE IN SCOTLAND. By ALEXANDER RAMSAY. Demy 8vo, cloth, 16s.

*The above Works can be had on application to WILLIAM BLACKWOOD & SONS,  
45 George Street, Edinburgh, and 37 Paternoster Row, London.*

# CONTENTS.

1. PERMANENT TIMOTHY-GRASS MEADOWS. By THOMAS DYKES	1
2. BOTANICAL INVESTIGATION OF THE PASTURES OF SCOTLAND. By A. N. M'ALPINE . . . . .	10
3. A SEASON'S EXPERIENCE OF A MECHANICAL MILKING AP- PARATUS. By JOHN SPEIR . . . . .	19
4. THE AMERICAN CHILLED PLOUGH IN COMPARISON WITH THE SCOTCH SWING-PLOUGH. By JOHN BARCLAY . . . . .	33
5. ON PRODUCE FARM RENTS. By T. W. LORIMER . . . . .	36
6. PASTURE-PLANTS. By JOHN B. WEBSTER . . . . .	49
7. GENERAL SHOW OF THE HIGHLAND AND AGRICULTURAL SOCIETY, HELD AT STIRLING IN 1891 . . . . .	68
8. OLD AND REMARKABLE HOLLIES ( <i>ILEX AQUIFOLIUM</i> ) IN SCOT- LAND. By ROBERT HUTCHISON . . . . .	80
9. THE UTILISATION OF WASTE PRODUCE OF FORESTS AND WOODLANDS. By A. D. WEBSTER . . . . .	95
10. THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1891, AND METEOROLOGY OF THE YEAR RELATIVE THERETO— The Crops . . . . .	107
The Meteorology. By Dr ALEXANDER BUCHAN . . . . .	128
11. THE CULTIVATION AND MARKETING OF STRAWBERRIES IN CLYDESDALE. By JAMES BARR, jun. . . . .	135
12. CATTLE-FEEDING EXPERIMENTS, WITH AND WITHOUT SPICES. By JOHN MILNE . . . . .	154
13. STACK ENSILAGE. By Admiral CAMPBELL . . . . .	162
14. FEEDING AND MANAGEMENT OF WORK-HORSES. By ARCHI- BALD MACNEILAGE . . . . .	167
15. CATTLE-FEEDING. By JOHN HART . . . . .	191
• 16. AGRICULTURAL STATISTICS OF SCOTLAND, EXTRACTED FROM THE GOVERNMENT RETURNS . . . . .	206
17. HIGHEST, LOWEST, AND AVERAGE PRICES OF HOME-GROWN WHEAT, BARLEY, OATS, AND BEANS IN EDINBURGH MARKET FOR 1891 . . . . .	214

18. PRICES OF SHEEP SINCE 1818 . . . . .	221
19. PRICES OF WOOL SINCE 1818 . . . . .	223
20. CHEMICAL DEPARTMENT. REPORTS by Dr ANDREW P. AITKEN, Chemist to the Society—	
(1) Pumpherston Experimental Station—	
Grass Crop, 1891 . . . . .	224
Botanical Analyses of Fourth Year's Grass . . . . .	226
(2) Feeding Experiment to determine the Relative Value as Fodder of Ryegrass eaten green and after being made into Hay . . . . .	240
(3) Manurial Experiments throughout Scotland—	
Experiment VIII. The most Economical Turnip Manure . . . . .	255
Experiment VI. The most Economical Turnip Manure—Early <i>versus</i> Late Manuring, etc. . . . .	272
Experiment IX. Soluble Nitrogenous Manures and the time to apply them . . . . .	275
(4) Analytical Associations—	
Report for 1891. Deficient Manures . . . . .	287
(5) Experiments to prevent Potato Disease—	
With Bordeaux Spray . . . . .	292
With Sulphate of Copper and Lime. By John Speir . . . . .	298

## APPENDIX (A).

PROCEEDINGS OF THE SOCIETY AT BOARD AND GENERAL MEETINGS . . . . .	1
PLAGUE OF MICE OR VOLES . . . . .	34
PREMIUMS AWARDED BY THE SOCIETY IN 1891 . . . . .	42
ACCOUNTS OF THE SOCIETY FOR 1891 . . . . .	69

## APPENDIX (B).

PREMIUMS OFFERED BY THE SOCIETY IN 1892 . . . . .	1
MEMBERS ADMITTED SINCE THE LIST WAS PUBLISHED IN APRIL 1891 . . . . .	85

\* \* It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the Writers whose Papers are published in the 'Transactions.'

# TRANSACTIONS

OF

## THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

### PERMANENT TIMOTHY-GRASS MEADOWS.

By THOMAS DYKES, Bent Farm, Lesmahagow.

ON many a farm in Scotland, not situated in the finer agricultural districts, meadow-hay is a very important crop, and often, especially in pastoral districts, forms the chief part of the fodder intended to tide the stock over the winter months. We could point to a great many farms in the dairying districts in the south-western counties where a well-managed timothy meadow is an indispensable adjunct of the farm. In the uplands where stock-rearing or dairying is pursued, and in districts where cultivation has been pushed far into the moor, it is often found that the cheapest and most satisfactory way of raising fodder is by growing timothy. We have seen splendid fields of it growing at an altitude of 1000 feet above sea-level, where in many seasons oats did not ripen. Even in places lower down, it has come to be admitted that this method of growing fodder is superior to ploughing and sowing oats, and that not merely at the moor-edge, but in places where very good marketable oats are grown. The timothy meadow is generally to be found near the farmyard, in a position and at a level to receive the drainings from it, thus usefully employing as manure what would otherwise be a nuisance if allowed to run to waste. If situated in an undulating country, when properly treated, it yields a splendid forage crop, at the least possible expense, the manure cost-

ing nothing. Often there will be parts of the meadow, if the soil is porous, or if it is of some size, that the sewage cannot reach; but, as will be shown farther on, these plots can be very economically manured, so as to produce permanently sure and splendid crops of hay. Take away the timothy meadow from some of these farms, and you make a serious inroad on the rent-paying capabilities of the farm.

Formerly meadow-hay was entirely composed of natural grass, frequently grown in wet or marshy places, and composed largely of sprets, and other coarse material of that kind. The term applied to it, "bog-hay," gives us some idea of its composition. Though in some districts of the south-west, particularly in the counties of Lanark, Ayr, and Renfrew, and in certain places north of the estuary of the Clyde, these meadows have nearly all been drained, cleaned with a green crop, and sown out with timothy, to the great advantage of both landlord and tenant; yet whoever takes a journey by day on any of our trunk-lines of railway, will see many of the former class of meadows still. Some drain these, which considerably improves the natural hay; but I am certain that the advantage to be gained by both draining and cultivating and sowing timothy, has only to be made known to be more widely adopted. In the Kilbride district of Lanarkshire, and in parts of the county of Renfrew adjoining, we spent many hours travelling without seeing a single meadow that was not sown down with timothy. This is entirely the reverse of what is to be seen in many other parts of the country, where no timothy meadows may be said to exist. Timothy-growing has been tried in the Penicuik district of Mid-Lothian, with very marked success. Experiments with it are presently being carried out in the Glenkens in Galloway, and in various other places to my knowledge; and these should afford evidence as to its suitability for their respective districts. In Avondale, Lanarkshire, there has been nearly a clean sweep of the old bog-meadows, and timothy substituted, the land being drained and properly cleaned preparatory to the sowing. Strathaven moss, which at one time was almost worthless, has undergone this process, and is now rented at £4 per acre for growing timothy. In the Lesmahagow district scores of these bog-meadows have been drained within the last fifteen years, and most of those that remain only await lease and other considerations to follow suit. I have interviewed dozens of farmers who have performed this operation, and so speak from experience; and the universal verdict is the same as my own, that they have now more hay of better quality, and that, too, with a great deal less labour at the busy season of hay-harvest.

On account of the undrained state of the land, and sometimes owing to large irrigation trenches, bog-hay had mostly, in some

cases entirely, to be cut with the scythe; some of it in wet seasons had even to be carried on to dry places of the meadow or the adjoining field. The process of making such stuff into hay was tedious in the extreme; neither the mowing-machine nor the horse-rake could be used. On the other hand, from the consolidation of the land by draining and cultivation, it can be expeditiously cut down, raked into coles, and secured in the rick in a remarkably short space of time; no kind of hay being more easily made than timothy. In days when we hear complaints of the scarcity of hands, it may be noted that the mower, horse-rake, and rick-lifter are all available, where formerly in the bog they could be little used. The machinery at hand in these days for hay-harvesting affords the means whereby very few persons can perform an astonishing amount of work. The advantage of the short way of making our hay, compared with bog-hay composed of sprets and the like, will be fresh in the memory of many hill farmers, after the experience of the hay-harvest of 1891.

The methods adopted for the conversion of a bog-meadow into a permanent timothy meadow are, with slight modifications, the same as are pursued in ordinary improvements of the farm. First, the land must be drained. Some do this and allow it a year or two to consolidate: the farmer must be the judge of the expediency of this. We have never done it, always preferring to drain early after the hay comes off, then get it ploughed and sown with oats for next crop. The newly put in drains may be a slight hindrance at ploughing, but they are much worse at hay-time. Some take two crops of oats in succession to allow the old tough sward time to rot. Then comes a green crop, generally potatoes or turnips, care being taken that the land is thoroughly cleaned. It is most essential that all weeds be eradicated. I have seen meadows carefully managed in all other respects but this, and while they were improved certainly, yet the omission of the cleaning by a green crop or otherwise was a vital mistake,—it never gave satisfaction, and only lasted a few years. Having the land thoroughly clean, there is no difficulty in making a permanent timothy meadow. It is sown out the following year, generally with a corn crop, but sometimes with rape, and fed off with sheep. No method is better than the latter. On the farm of Hazelside, in Douglasdale, there are fine timothy meadows, laid down in this way without a crop. Not every one will be in a position to sow down the meadow in this way, however, and one plot of five acres, which we summer-fallowed and sowed out without a crop, did very well, but not a whit better than where it was done in the ordinary way with a crop of oats or barley. The risks of the young timothy plants are not greater than that of ordinary grass



mixtures sown with a corn crop. Should the corn lodge before harvest, some have had it cut green; but this is not absolutely necessary, as timothy will survive a very hard winter though sown as late as the first week of September. This we have frequently verified by experiment here, at an altitude of 600 feet above sea-level, though it is better to sow earlier. The places where the corn lies down may have a cast of seed as soon as it is cut.

The quantity of seed used for sowing down a meadow is about 20 lb. to the acre, which has always been found sufficient in this district, though I have used less seed myself, preferring to buy the best seed procurable, and sow rather less of it. On 39 acres sown at various times on this farm, the seed used was as near as possible the same quantity in every case—viz.:

	lb.
Best Scotch timothy . . . . .	14
Red clover and alsike . . . . .	5

In all per acre (besides some Italian rye-grass)	19
--	----

It has been sown out both with and without Italian rye-grass—the kind of soil must determine which. If pretty strong or clayey, sow Italian—whereas on mossy soil the Italian often grows in large tufts in autumn and chokes the timothy: in this case it is better without it. Many farmers in the Strathaven district do this, and have a surprising crop of timothy the very first year. I have also done it with Scotch timothy seed and clover on strong clayey soil, using plenty of manure, and had always a maximum crop the first season. Some sow perennial rye-grass, which, however excellent it may be for pasture, is totally unsuitable for a permanent timothy meadow. Its small thin stalks occupy ground that the taller and more robust timothy should occupy, and its seeds ripen too soon. After repeated trials we have abandoned it altogether.

Scotch timothy is generally preferred, and we believe this is a wise choice. In 1884 we had a plot sown with foreign seed in a field entirely sown with Scotch timothy. The former was so deficient, year after year, compared with what was grown with home seed, that all to whom it was shown were surprised, and no one ever thought the experiment worth repeating. At the same time, we have found very best foreign Italian rye-grass give superior results. A neighbour of mine had a mixture of cocksfoot, meadow-fescue, and meadow-foxtail largely sown amongst the timothy. There was only a wire fence between his and mine, sown without these extra grasses, and he was the very first to admit the simpler mixture was by far the best for the purpose. It was less expensive, and much more productive. One farmer in the Lanark district sows a mixture of cocksfoot

amongst the timothy for the sake of the aftermath, his meadow being irrigated; but except in exceptional circumstances we cannot recommend the practice.

To obtain good crops of timothy it is by no means necessary that it be grown where an old meadow has been. It thrives quite well, if properly manured, on rather poor, clayey soil. The knowledge of this secret will often allow the farmer to employ profitably his worst soil, reserving his best ground for less dainty crops than timothy. The old meadows, where not mossy, are frequently composed of soil by no means poor, as is evidenced by the fact that a crop of hay was cut and removed from them for many years in succession, little or no manure being given. Frequently situated in a hollow, or beside the burn, many of them, or at least parts of them, are composed of deep alluvial or lacustrine soil; and should there be poor clay on the farm, the old meadow-land, in some cases at least, can be set apart for other purposes. In what were quite recently bogs, and which have since been drained, we have seen splendid crops of oats, turnips, potatoes, and even carrots; whereas the thin poor soil on the same farm, now growing timothy equally well, would not bring one of these crops to perfection—and it is certain that growing carrots, if not potatoes also, would never be attempted on it.

We have followed this principle out, and found it of considerable pecuniary advantage, as thereby land worth only 10s. per acre, grows with us as much marketable hay as alluvial loam valued at 50s. per acre. A field, which in the fine season of 1878 only kept one Ayrshire stirk to every  $2\frac{1}{2}$  acres, in other words worth only 10s. per acre, was sown as a permanent meadow in 1884. The previous crop was turnips, and the timothy was sown with a corn crop. In a plot of 8 acres the allowance of seed was:—

Best home timothy	. . . . .	1 cwt.
Red clover	. . . . .	30 lb.
Alsike	. . . . .	10 "
Italian (best foreign seed)	. . . . .	$2\frac{1}{2}$ bushels.

A plot was sown without Italian and did equally well, even the first year, but received rather more manure. The manure allowed was about 10 tons dung per acre annually, and from 1 to  $2\frac{1}{2}$  cwt. nitrate of soda in the month of May. We think this better than putting on 20 tons dung every two years, with nitrate in the intervening year, as some do; for on plots left without dung occasionally, the timothy had a tendency to go out, and other grasses take its place. Where treated to 10 tons dung every season, properly spread, and nitrate in the spring, the yield of hay, which was only 166 stones the first year, went

on increasing till it reached the maximum in 1888 and 1889, when it gave 350 and 400 stones respectively per acre. When timothy is treated in this way, the land being of a firmish kind, it ought to be permanent. In cases where it is not permanent, it is generally from lack of manure. From actual experiment we ascertained, however, that the dung could be omitted a year or two at a time after the fourth year. The nitrate always gave splendid results, the soil being heavy, consequently it was never omitted except on trial plots. With nitrate cheap, and land of this description yielding sometimes  $3\frac{1}{2}$  tons and over per acre, we should be able to hold our own with foreign competition in the matter of hay production. There have been considerable imports of Canadian hay into Glasgow this season owing to scarcity. The freight, except under exceptional circumstances, is from 30s. to 40s. at the quay. It has sold at £5 to £6 per ton. The price in the closing months of 1890 was £3, 15s. to £4 per ton. In the autumn of that year home hay was sold at prices which the importers assure me were prohibitive of American competition. It is noteworthy that the best foreign hay, and that which commanded the highest price, is timothy.

Trial plots in various places of the meadow were treated regularly with superphosphate and sulphate of potash as a test. These gave no increase at all, which may seem surprising to some; but on heavy land this is very common. Police manure does exceedingly well; but for the sake of the machine-knives when cutting, we preferred ordinary farmyard manure. A friend in the Mauchline district writes, that he finds the best manures for timothy are phosphates and ammonia, from whatever source they can be most cheaply procured. On lighter soils than ours phosphatic manures will come in useful—and surely it cannot be too much trouble for the farmer to ascertain this by experiment.

There is a belief pervading many quarters, especially where light land is farmed, that nitrate is a very scourging manure, if not valueless altogether. That has not been the experience of the writer. The land here being mostly heavy, the climate and rainfall suiting the growth of timothy, nitrate seems to give magic results. For an application of it costing less than 20s. per acre, we have frequently had  $1\frac{1}{4}$  tons hay extra, as was verified by actual weighing. Of course dung was used on both plots, as timothy is a gross feeder. To test the question of exhaustion by nitrate, a plot which had annually received dung for a number of years, but no nitrate, was at last treated to it, the quantity given being the same as to the rest of the field. Now if there had been a process of exhaustion going on, it was quite reasonable to look for the first application of nitrate telling better than the sixth, as the rest of the field had all got it for the sixth year. It did not; the crop on being weighed

showed no difference. On this kind of soil—and there are large tracts of it in Lanarkshire—dung put on in autumn, or even during the winter, as the farmer has time, and nitrate in the spring, will be found a very suitable manure for timothy. We have tried all sorts of phosphatic manures on this class of soil, including bones of various fineness, down to the finest meal, superphosphate, dissolved bones, slag, and Liebig's meat-meal, and where these gave any increase it was due to the nitrogen they contained. In different seasons nitrate has been tried alone, and also in conjunction with slag and superphosphate—sown separately, of course—and the extraordinary result was, that the nitrate only gave any increase, which was the same with or without these manures. This may be an extreme case, but should be noted. But where phosphates are useful, let them be put on,—the farmer can easily determine their utility by a few simple experiments. When they do very well, it must be fortunate, for they are cheaper. On the heavy soil of our meadow, superphosphate gave very good results on turnips in 1883; but, as we have seen, had no effect when applied to timothy, on the very same soil, in subsequent years.

Some objectors to the use of nitrate for hay have urged that the increase of crop, very visible to the eye when growing, is a fictitious increase—so much added water, and so on. To afford reliable information on the subject, some experiments were carried on by the writer. In 1886, timothy that had received nitrate, and some that had received none, were weighed, when newly cut in hay-time, carried out into another field of rye-grass stubble, and carefully made into hay. As both kinds were done simultaneously, the weather was the same for both. When properly dried into hay, they were re-weighed, and that which had received nitrate was found to have dried in less than the other by fully 4 per cent. No one, perhaps, would have been prepared for this result; but that grown with nitrate was much stronger in the stalk. Both samples experimented on were obtained from clayey soil, and grew side by side. The hay was kept till June of the following year, and the weighing then gave the same results.

Approximate cost of growing an acre of timothy:—

10 tons dung, including cost of application, at 6s.	£3	0	0
Nitrate . . . . .	1	0	0
Rent, say . . . . .	1	0	0
Labour and other expenses . . . . .	1	0	0
Total . . . . .	£6	0	0

We by no means think that any application of dung, even in small quantities like this, is exhausted the first year. But if we allow two-thirds of it as exhausted, this brings the cost down to £5 per acre. Now, as it stands in the rick, it should

be at least worth £10. It is true that in 1890 it was obtainable from the rick at £2, 10s. per ton, but in the following spring it rose to £6. It weighs better than rye-grass, and generally produces a heavier crop.

In many places there is a ready market for good timothy-hay. It has been our experience that it is fully as much sought after as rye-grass. All the farm animals are fond of it; horses eat more, and waste less of it than rye-grass, and it is invaluable to the dairy-farmer. We have frequently observed wintering hogs refuse good rye-grass and turn to timothy. An extensive sheep-farmer writes, that he has often noticed sheep take to the timothy-stack, refusing others. It may be difficult to compete with those farming the very best soils, from which several cuttings of Italian rye-grass are obtained in one year; but timothy yields one main crop that will compare favourably with any other, and brings the upland farmer sometimes as no mean competitor in the market where hay is sold.

The yield of a crop of timothy will vary considerably, even in cases of good husbandry, though it is less subject perhaps than most farm crops to the vicissitudes of season and climate. Perhaps it succeeds somewhat better in the humid climate of the west than in the east of Scotland. From 2 to 4 tons per acre may be set down as the yield of a good timothy meadow, and we think no difficulty should be encountered with proper treatment in growing that quantity. In dry seasons we have repeatedly observed that the early summer's drought did it much less harm than rye-grass, it being later. From parties on whom we can place implicit reliance, we are assured that 5 tons and more are frequently obtained. But instead of attempting such heroic results, it is well, unless the soil be very good, to look for less. Such heavy crops are more difficult to win in wet seasons, and the ordinary horse-rake, if employed to gather it out of the swathe, will be found needing enlargement. The highest yield we have ascertained by actual weighing on the clayey soil here was  $4\frac{1}{2}$  tons per acre, and it takes plenty of manure to obtain even that.

Timothy is the favourite grass for an irrigated meadow, and when fairly established is not particular whether the land be wet or not, as we have seen it growing very well when properly nourished where water is almost continually run on, but drained. One method of utilising the sewage of the farm is pursued with considerable success here. It consists in so arranging the drains that the same water is brought to the surface lower down the meadow each time, and run on again, so that it is used several times. The old drains are some 27 inches deep, and are all cut with a cross one, which, some yards farther down, can be easily brought to the surface, the slope being sufficient. The only drawback is, that only on a limited

number of farms can this method be applied, as it requires considerable fall. But when it can be done, I do not think any better plan has ever been devised for using the sewage of the farm, as it requires almost no labour or expense, and is not liable to go wrong. On this farm the flow of water is used in this manner three times, so that the urine from the byres manures fully twice as much as would otherwise be possible, the subsoil being clayey, and no impure water is allowed to go into the stream, a highly important matter in itself.

Several meadows here were drained and cut for a length of time, and while the draining improved the natural hay, yet they were much inferior to those cultivated and sown with timothy.

The uncertainty of our climate is certainly a drawback, but growing timothy in preference to bog hay helps greatly to minimise the risk. It is very frequently put into coles the second day if the weather be fair. Even in the very worst seasons, in districts where the rainfall is heavy, there are short spells of dry weather. The interesting problem is, How can we be accurately forewarned of their approach? Most farmers use the barometer, which tells the pressure locally; but some of our newspapers publish daily what gives us a fair idea of the pressure over the whole of Western Europe. We are surely in a better position to judge knowing the pressure over a very wide area, than merely knowing it locally as indicated by the farmer's weather-glass. We can point to instances where this has greatly helped us in the hay-harvest. A commodious hay-shed for storage at the farm-steading is also a great boon, especially in high and exposed districts.

Two of the meadows, which were cut for a number of years and manured annually with dung and nitrate of soda, were afterwards pastured with cattle. It was found they were much improved for grazing. There was abundance of white clover, though none was sown, and they carried twice the number of stock. In six years 60 tons of dung had been applied per acre, the residual value of which must have been considerable, and which no doubt largely accounted for the result. Now all this manure was handsomely paid for from year to year by the timothy crop; indeed I consider this a very good and inexpensive way of improving some kinds of poor land. It is also a thorough way of eradicating thistles. Besides, a crop of from  $2\frac{1}{2}$  to 4 tons of hay means a large quantity of vegetable matter in the soil in the shape of the rootlets of the plants, and which comes to be available for plant-food by-and-by.

On the whole, we are convinced that this crop ought to get more attention than it does, and think that many landlords will materially enhance the value of their properties by a judicious encouragement of timothy-growing.

BOTANICAL INVESTIGATION OF THE PASTURES  
OF SCOTLAND.

By A. N. M'ALPINE, Botanist to the Society.

THIS continuation of the botanical report which appeared in the 'Transactions' of 1890 deals mainly with the following points:—

1. The most advantageous proportion of clover to grass.
2. The causes which retard or favour clover-growth.
3. The causes which lead to pasture deterioration.

THE MOST ADVANTAGEOUS PROPORTION OF CLOVER TO GRASS.

*Nutritive value of clover.*—White clover (*Trifolium repens*) is the staple leguminous plant of our pastures; red and alsike die out during the first years of the ley. The nutritive value of white clover is high, as shown by the following analyses taken from Wolff:—

The composition of 100 lb. of white-clover hay is—

Water	.	.	.	.	1b.
Organic matter	.	.	.	.	14
Mineral matter	.	.	.	.	79.8
					<u>6.2</u>
Total	.	.	.	.	100.0

The organic matter is composed of—

Albumen . . . . .	lb.	14.9
Fat . . . . .		3.6
Carbohydrates { Non-nitrogenous extractives		34.9
{ Fibre . . . . .		26.4
Total . . . . .		79.8

The proportion of this organic matter assimilated by the animal is 58 per cent—that is, 47.4 lb.—

Albumen . . . . .	lb.
Fat . . . . .	8.4
Carbohydrates . . . . .	2.0
	37.0
Total . . . . .	47.4

The nutritive value expressed in units is—

Albumen . . . . .	8.4 × 5 = 42
Fat . . . . .	2.0 × 5 = 10
Carbohydrates . . . . .	37.0 × 1 = 37
<b>Total</b> . . . . .	<b>89</b>

Average meadow-hay has a nutritive value of 73 units, and

perennial rye-grass 65 units; therefore the white-clover hay is worth about one-fifth more than average hay, and one-third more than rye-grass. The ratio of the assimilable nitrogenous to the assimilable non-nitrogenous nutriment (albuminoid ratio) is also high—1 : 5, as contrasted with rye-grass, 1 : 7.3.

*Clover proportion.*—In good permanent pasture the proportion of white clover should be kept up to 20 or 30 per cent—that is, the clover should cover at least 20 or 30 per cent of the land. To attain this result, 2 to 3 lb. of *perfect* white-clover seed are required per acre. (Perfect seed has purity = 100 per cent, and germination = 100 per cent.) As the perfection of commercial white clover reaches on the average only 75 per cent, from 3 to 4 lb. of commercial seed will be required per acre. The calculation must be made for each quality of seed. Examples of pastures with good proportions of leguminous herbage are: Fife district, Stravithy, No. 2; Edinburgh district, Barnton Parks; Ayrshire district, Dalry; Lanark district, Newton; Stirling district, Sauchie; Lauderdale, Boon. (See previous report.) All the pastures which feed well and which feed best show the high percentage of clover; absence is as characteristic of low-feeding value.

*Influence of season.*—It is always a noticeable feature of pastures that where grass is specially luxuriant clover remains more or less in abeyance. This is due to two causes: the grass is favoured by the soil condition, and the clover—a bottom plant—is overshadowed. The shaded clover cannot assimilate carbon, and suppression due to carbon,—starvation is the result. This is the case during good seasons when the nitrifying germs are most active. In wet seasons nitrification is to a large extent stopped, and the clover now assumes the upper hand.

#### THE CAUSES WHICH RETARD OR FAVOUR CLOVER-GROWTH.

*Symbiosis.*—Clovers, like leguminous plants in general, have warted roots—a striking peculiarity. These root-warts are termed tubercles or nodules, and have been proved to contain a special set of germs called bacteroids. The work of the bacteroids is to build up nitrogen compounds from the free and uncombined nitrogen of the air present in the soil. A clover plant is thus a symbiotic organism—a company of two partners, the clover on the one hand, the bacteroid on the other. The bacteroid provides suitable nitrogenous nutriment for the clover, and in return for this provision receives board and lodging.

*Nitrogenous food.*—Such symbiotic organisms may live and thrive in soils devoid of nitrogenous manures. The nitrogen compounds formed by the germs constitute the nitrogenous food



of the clover-plant. Thus the nitrogen of clover albuminoids has been derived indirectly from air nitrogen: this is one of the chief reasons why the growth of clovers is so profitable—they do not, like grasses, require nitrogenous manures.

*Clovers as manure.*—It is therefore plain that the presence of clover in a pasture is equivalent to nitrogenous manuring, since the old clover roots when dead are nitrogenous manure for the associated grasses. The roots of white clover may penetrate in a good soil to a depth of 15 inches, and accordingly the nitrogenous manure which they yield is distributed through this depth. The clover-root manure is slowly converted into nitrates (or ammonia compounds) suitable for feeding the pasture grasses. This *gradual* conversion is of special advantage on light soils, as there is little loss from the washing away of nitrates and ammonia compounds into the drains.

*Carbonate of lime.*—The clover germs require oxygen for working up the free nitrogen into plant-food. Part of the oxygen used for this purpose is, apparently, not the oxygen of the soil air, but the oxygen of soil compounds such as carbonate of lime. This explains to some extent certain peculiarities of clovers—their relative abundance on calcareous soils, their luxuriance on heavy soils, on undrained ground, moorland, and so forth. Clover roots carry with them and in them an oxygen-making apparatus, and when soil-oxygen is insufficient through excessive heaviness of the land, or imperfect drainage, the roots may still carry on their breathing and their growth, because they have an oxygen supply independent of the soil air. This action of carbonate of lime requires further investigation.

*Oxalate of lime.*—One other point regarding the soil requirements of clover must be borne in mind—a large supply of lime salts is necessary. The relation of the lime to the clover-plant is obscured by regarding it as clover nutriment. Most of the lime used serves as an antidote for a poisonous acid (oxalic), produced abundantly by a normal process of fermentation, which goes on in all clover-plants. The lime which enters the clover combines with this poisonous acid, and an inert substance, oxalate of lime, is produced. If a clover-leaf from which the green colour has been removed by alcohol is examined under the microscope, the cells show themselves loaded with oxalate crystals. None of the grasses cultivated in our pastures have the oxalate, hence little lime is required by them. A comparative chemical analysis of the ash of grass and clover demonstrate the same point.

100 lb. of ash contain (Wolff):—

	lb. lime.
White clover . . . . .	30
Perennial rye-grass . . . . .	10
Cocksfoot . . . . .	6

*Clover-growth.*—Knowing these things, we are in a position to explain why clover is abundant in certain pastures. Its presence tells us little regarding drainage and nitrogenous condition, but indicates that the other requirements are fulfilled. These are in the main the presence of carbonate of lime, potash compounds, and phosphates. Small quantities of sulphates and magnesia compounds must also be present.

*Summary.*—The causes which favour the growth of clover in pastures may be summarised thus:—

1. Presence of finely divided carbonate of lime.
2. Presence of phosphates.
3. Presence of potash compounds and sulphates.

The effect of liming is exemplified by the old pastures of District II., District IV., District VII., pasture No. 3 (see previous report). A number of the other pastures referred to in the report might be considerably improved by an application of lime.

#### THE CAUSES WHICH LEAD TO PASTURE DETERIORATION.

*Causes.*—The main causes which lead to pasture deterioration are—

1. Use of an unsuitable seed-mixture.
2. Incomplete occupation of the land.
3. Imperfect drainage.
4. Deficiency of lime compounds.
5. Deficiency of plant-food.
6. Mismanagement.

##### 1. *Use of an unsuitable seed-mixture.*

*Rye-grass mixtures.*—A sowing of rye-grasses and clovers is a most unsuitable mixture for a permanent pasture, because the bulk of the rye-grasses die out in a very few years. When the land is thus left vacant, and given over to chance indigenous species and weeds, a good pasture cannot be expected. Chance cannot give a good crop of wheat or turnips, neither can it yield a good pasture even on good soils. The pasture grasses which have been selected for cultivation are peculiar in this—they give the maximum nutriment at the minimum expense, and no sane man need expect chance to select those plants for him. True it is, that a comparatively worthless grass may be of considerable value when grown on a good soil and well fed, but a carefully selected species put in its place would undoubtedly be much more valuable.

*Rye-grass controversy.*—It has been stated above that rye-grass—perennial is referred to—dies out in a few years. Pas-

tures 2 and 3 of District I., and the series of pastures District IV. (see previous report), verify this statement. It is not contended that all the perennial rye-grass dies out, but certain it is that the perennial has largely diminished in most of the old pastures examined to decide the point. With this fact in view, the farmer evidently makes a mistake if he relies on perennial rye-grass for his permanent pasture.

On the other hand, it is equally true that there are extremely old pastures in Scotland which teem with perennial rye-grass—witness the extremely old pastures at Howell, Kirkcudbright, referred to in the previous report. The old pasture behind the Academy at Irvine in Ayrshire, and the grass by the shore at Aberdour in Fifeshire, tell the same story.

The truth about perennial rye-grass is this: on light soils it dies out after the second year, whereas in moist districts and on good heavy soils it will last for seven years or more. Where the rye-grass fruits and seeds abundantly, it soon dies out; where seeding is scant or prevented by depasturing, the grass lasts longer, and may even become a true perennial. Along our sea-coasts where the land is heavy and contains sea-salt, it seeds less abundantly, and is therefore lasting.

*Mistakes in mixtures.*—The prevalent mistakes in seed-mixing are—

1. Use of too large a proportion of rye-grasses.
2. Use of bad seed.
3. The purity and germination of the seed used is unknown.
4. Improper selection and proportioning of the constituents.

The whole question of mixture-making is discussed in the 'Transactions' of 1889.

## *2. Incomplete occupation of the land.*

If the land is incompletely occupied in depth or surface, a loophole is left for the entrance of comparatively worthless grasses—the much vaunted indigenous species—and weeds. The business of the farmer, when laying down a mixture, is to express his idea in terms of grass and clover, but if he leaves bare and unoccupied ground, his idea is of course obliterated, and promiscuous chance reigns supreme. This is the usual sequence of too much rye-grass and too much red clover. To accomplish his idea, and to prevent as far as possible the inroad of worthless species, a cunningly devised mixture containing the proper amount of seeds of known quality must be sown. Such mixtures can readily be calculated from the data regarding them in the 'Transactions' of 1889, if the quality of the seed used is known.

### 3. *Imperfect drainage.*

*Moss.*—Every root in the soil, so long as it is living and active, requires a soil atmosphere containing oxygen gas for purposes of breathing. (See carbonate of lime.) Where there is little or no soil atmosphere, the roots must of course stop, and are practically dead. The deeper the root the more liable is it to be stopped by deficiency of healthy soil atmosphere. Thus it happens that in an imperfectly drained soil the deep-rooted plants are killed off, and the surface-rooted species obtain the upper hand—that is to say, a deep soil has been converted into a shallow, the produce is correspondingly diminished, and comparatively worthless species—bent-grass, Yorkshire fog, hard fescue—occupy the land. Furthermore, in extreme cases the very surface of the soil is the most suitable habitat for plant roots, and now the mosses come in and take possession of the suitable quarters provided for them by imperfect drainage; this is the meaning of the moss or “fog” in pastures.

There is another aspect of this same question, very erroneously dealt with in standard works on agricultural science. While the roots are breathing in the soil they are evolving carbonic acid gas ( $\text{CO}_2$ ). Not only the roots, but all the decaying organic matter in the soil, are evolving into it this same carbonic acid, or other more poisonous carbon-containing gas. The scientific agriculturist leads us to believe that the presence of a large amount of carbonic acid gas in the soil is an unmitigated blessing, but the plant root tells us that it cannot work in such an atmosphere, and agricultural practice teaches the self-same lesson. The poisonous gas is eliminated from the soil mainly by drainage, and to a certain extent by entering into chemical union with appropriate substances in the soil which serve as antidotes. If the soil is working mainly on the antidote principle, the time soon comes when the antidote is all used up and the carbonic acid then exerts its poisonous activity on the roots within its reach. The surface soil is now most habitable; the moss steps in and takes possession.

*Modification of herbage.*—Under these circumstances of imperfect drainage, the herbage actually present is considerably modified, and for the worse. The woody matter in the plant increases, and hand in hand with this, the amount of silica rises, so that the browsing animals would thrive almost as well on sandpaper and wood-shavings. One of the main antidotes for moss and for woody silicious herbage is accordingly improved drainage. Liming is merely a temporary remedy.

#### 4. *Deficiency of lime compounds.*

•*Clovers.*—Of pasture plants, the clovers are most influenced by lime deficiency, because, as already explained, they require an extra supply for the formation of lime oxalate.

*Grasses.*—Furthermore, the transformation of organic compounds of nitrogen into nitrates takes place in presence of carbonate of lime, and of a soil atmosphere containing oxygen gas. Many of the complex nitrogen compounds in the soil are poisonous, and these, if allowed to remain unchanged in the soil, must be exceedingly injurious to the roots of the pasture plants. The nitrifying germs, however, manufacture these into nitrates—the most suitable nitrogenous food for the grass portion of the herbage. These nitrates can hardly escape into the drainage water from a good old pasture containing deep-rooted species, because the roots form a felt-work comparable to a piece of blanket, as is easily perceived when a sod is taken and the earth washed away from the roots.

*Top-dressing.*—The same reasoning shows that a top-dressing is mainly beneficial to the surface roots, and has less action on the deeply-rooted species—hence the change of herbage investigated at Rothampsted.

#### 5. *Deficiency of plant-food.*

*Requisite plant-food.*—It is important here to notice what the soil-food of pasture plants really is. The grasses require nitrates (or ammonia compounds), sulphates, and phosphates of potash, lime, and magnesia, and, of course, an excessively small quantity of an iron compound. The clovers and leguminous herbage have the same requirements, with this difference, that no nitrogen compound is necessary, but merely a soil atmosphere containing nitrogen gas.

*Silica.*—Agricultural scientists state that silica is an important grass food, but when the plant is questioned on the subject, it tells us distinctly that sand (or silica) is no nutriment. Its presence is merely an accident, and the aim of the farmer should be to feed his pasture plants in such a way that they are forced to take in less and less silica with their real nutriment. By pursuing this policy he can assuredly replace the bad blade by the good, if he may not produce two blades where one only grew before. The practical man easily tells the bad and improperly fed pasture plants by their hard feel between the fingers. Chemical analysis seems to bring out the same point—this, namely, that as the soil improves the percentage of silica in the grass diminishes, and the real nutritive value of the plant is correspondingly increased.

*Soil-germs.*—It must also be borne in mind that to keep his

pasture going for a series of years, the agriculturist must, of set purpose, breed and feed soil-germs, just as the brewer breeds appropriate yeast plants in his vat. The food of the nitrifying and other soil-germs consists of dead organic matter, nitrogenous and non-nitrogenous, and, in addition, sulphates and phosphates of potash, lime, and magnesia. An agricultural soil containing *organic matter* forms a suitable habitat for germs, which work much cheaper than other manure manufacturers. The nitrogenous excreta of the soil-germs are readily converted into nitrates or ammonia compounds suitable for the nutrition of pasture grasses. The phosphates taken up by the germs are converted into an integral part of their body, and are only liberated when the germ decays. In this way soils can retain phosphates, but not germ excreta such as nitrates. The potash consumed by the germ does not form an integral part of its body, and, accordingly, escapes with comparative ease from the weakened or plasmolysed germs. The same applies to the lime and magnesia.

*Nitrogen compounds from air.*—Another point to be borne in mind is that the nitrogen compounds in the pasture soil are added to from the air, either directly, or indirectly as by the germs in the root-warts of clovers and leguminous plants.

*Deficiencies.*—Taking these things into consideration, it is evident that pastures containing a sufficiency of clover are rarely deficient in nitrogenous compounds. Sulphates are rarely deficient. Phosphates are used and fixed by the soil-germs, the pasture plants, and the browsing animals. There is no extraneous supply. Accordingly, the soil is very liable to be more or less exhausted of phosphates, and then a minimum crop must be the result.

Potash is another compound often deficient in soils, because it is removed by the green plant and the browsing animal. Such exhaustion must be prevented at any cost, because potash is a main factor in carbon assimilation; when this process is interfered with, the plant must literally die of hunger.

Lime in the form of carbonate is so important for soil-germs, clovers, and, to a less extent, for the grass herbage, that its presence in the soil becomes a matter of great moment. There can be no doubt that many pastures would be considerably improved by carbonate of lime.

Magnesia is usually present in sufficient amount to meet the requirements of the plant.

#### 6. *Mismanagement.*

Under this head one or two features may be specially noticed.

*Dogstail culms.*—In pastures containing crested dogstail, the

culms are often left standing, seed is formed and self-sown; the proportion of dogstail may thus increase to an unprofitable extent. Culm-formation is almost completely prevented by depasturing earlier in the year, as pointed out by Mr Speir of Newton, and verified by one of the railed-off plots.

*Ergot*.—In other pastures, many grasses are allowed to run to seed in the autumn. If the season is damp, the ears are black with ergot grains. The ergots fall on the ground, and next year each grain produces abundant spores, which are carried to the grasses. Ultimately a new and larger crop of ergot is reproduced. By allowing this to happen, the farmer practically sows an ergot crop, and if not a good one, that is the fault of the season rather than his own. Surely this should be prevented till definite information regarding the real causes of abortion comes to hand. There can be no doubt that many pasture plants—especially the nitrogenous leguminosæ—suffer from germ diseases, and these may readily be transmitted to the browsing animals, as is the case with the “corn-stalk” disease of America.

#### CONCLUSION.

The conclusion then is this, that pasture improvement is to be brought about in two ways—by using better mixtures, and by studying the quantitative as well as qualitative requirements of the soil. Agriculturists have too long been under the dominion of the pernicious dogma that soils select the right kinds and quantities of herbage plants, and that plants themselves have some mysterious power of food selection. The practical man well knows that certain species are, from their very nature, capable of turning out more nutritive material in the shape of starch, sugar, fat, and albumen, than others, and that these selected kinds—indigenous or not—ought to be put in possession of the land in quantities arranged to occupy the surface and the depth. He knows that, like his animals, even selected plants are good or bad, fat or lean, according to the quantity and quality of their food supply—he must accordingly select and apportion these food ingredients. In the case of many pasture plants it is, indeed, a fortunate circumstance that the range of Liebig’s “law of minimum” is very wide, otherwise many tracts of land at present clothed with herbage would be bare as billiard-balls. Working on this minimum law, the farmer is an extravagant man, and almost bound to be a loser. For pecuniary reasons, he ought rather to proceed on the principle of “quantitative proportion,” and regarding his plant as a quantitative machine, apportion the various manures to his land as he does the food-stuffs to his animals. These *correct quantities* require investigation.

## A SEASON'S EXPERIENCE OF A MECHANICAL\* MILKING APPARATUS.

By JOHN SPEIR, Newton Farm, Newton, Glasgow.

IN all departments of farming, labour-saving machines during recent years are being very rapidly introduced. Of the many which have proved a success, probably none have been more urgently called for than the milking apparatus. Yet, although any number of patents have been taken out during the past generation, not only here but in other countries, none until the present instance appear to have ever been of any practical value. The principle involved, in almost all previous attempts as in this one, is suction; but through improper application they all failed.

The one tested by me is that introduced by Mr William Murchland, 13 Bank Street, Kilmarnock. Its patent number is 15,210, A.D. 1890, the date of application for patent being 27th September 1889. During the summer of 1890 I saw this apparatus in work, and, from 1875 to 1881, having worked very hard on an apparatus on the same principle, I was much interested in its success. I therefore agreed with Mr Murchland, in January of the present year, for him to fit up the apparatus in one of my byres, containing thirty-eight cows. My milking is done principally by the married men's wives; and I ordered the apparatus, not that the milking was any great difficulty with me, but almost solely for the interest I had in its success.

The apparatus was erected in March, and milking was begun with it immediately after. In this apparatus the vacuum is caused or regulated by a column of water from 13 to 15 feet high; and had I been possessed of a sufficient supply of gravitation water I would have employed it, but that supply being very limited, it was considered that the next best course to follow was to use a pump. Had I been quite sure of the success of the apparatus, I would in all likelihood have erected a ram on the river near at hand, and filled from it during the day a tank sufficient to do all the milking required. That uncertainty, coupled with the fact that my lease was nearly exhausted, compelled me to adopt the less satisfactory method of hand-pumping.

For a couple of weeks after erection the pipes along the byre leaked considerably, but an occasional coating of red-lead at the joints gradually sealed them up. As only one milking-can was available at first, not much was done in March other



than becoming accustomed to the apparatus and its mode of working; but a full supply of cans arriving soon after, twenty cows recently calved were at once set aside to be milked mechanically. As Mr Murchland had not yet decided what was the best pattern of teat-cup, these were all made of tin—not that he considered it preferable to many other substances which might be used, but because new patterns were easier made of it than most other substances. With the exception of one pattern, called No. I., all the other teat-cups were lined with india-rubber wherever they came in contact with the udder or teat, in order to take a better hold of the udder, hurt it less, and make the vacuum more complete. Many persons are apt to suppose that cows will fret when being mechanically milked; but, as far as my experience goes, there is not much to find fault with in the apparatus in that respect. Old cows, which have been previously milked, as a rule make no objections after the first or second time; and I have seen many continuing to chew the cud the very first time they were under it. An odd cow now and again will kick off the teat-cups; but in many herds kicking is not uncommon, even where all the milking is done by hand. As far as I am concerned, this matter has never given me any particular trouble, and I expect other people's experience will be very much the same.

When the milking apparatus was first started, it was noticed that very many of the cows' teats were quite hard and blue after the cups had been taken off. This apparently was caused by the circulation of the blood being more or less stopped, either by the pressure of the teat-cup against the neck of the teat, or in some way by the vacuum. This symptom I did not at all like; but after a little experience it was found that the hard feeling and blue colour gradually became less, and in the most of cases ultimately disappeared. When the apparatus was put up, Mr Murchland recommended that all cows which were mechanically milked should at no time be hand-milked or stripped or aftered, as some people call it. His reason for this course was, that when such was done the cows continued to keep up for the stripping process a greater and greater quantity of milk every day. I may mention that in some dairies where the milking is done by hand, stripping or aftering is not practised for the same reason.

When the apparatus was put up, I considered I would be able to form a definite opinion as to its value in one month, or at most in two. In this, however, I found I was very far mistaken, because, being prevented from stripping or hand-milking the cows, I had nothing to guide me as to the completeness of the milking other than the feeling of the udder;

which was a very indifferent guide. Had a register of each cow's milk been available for the year previous, it would have been of great value. Such, however, did not exist, so the most had to be made of the circumstances.

In every case the first milking or two seemed deficient, after which there was a considerable improvement; but whether or not all available milk was withdrawn was not so apparent. In order to get some information on this matter, two cows were milked mechanically on the one side of the udder and by hand on the other, the sides being changed every now and again. The result of this test was, that in the most of cases the quantity withdrawn by hand exceeded that withdrawn mechanically, by from  $\frac{1}{2}$  lb. up to  $2\frac{1}{2}$  lb., although in isolated cases the mechanical milking gave the best results. At this time (the first two weeks of April) most of the cows mechanically milked appeared to be giving a fair average compared with those being hand-milked, although some of them were not so completely milked as I would have liked.

About the middle of April difficulties began to be felt with those cows whose teats were hard and blue when the cups came off. Cow No. 1 had been giving before this an average of from 28 lb. to 30 lb. of milk daily; but she began to drop, until in a few days she was down to 20 lb. daily. Nothing appeared to be wrong with the general health of the cow: it was therefore presumed the mechanical milking was the cause of it. Cow No. 10 was in much the same position; both cows were therefore put off, and hand-milked. In a few days No. 1 regained her former yield; but No. 10 improved only very slightly, and in the end turned out one of the worst milking cows I ever had in proportion to her size and appearance.

From April forward a register was kept of the milk-yield of every cow which had calved from the time the mechanical milking began, so that at least some check might be had as to how they were doing, when compared with those hand-milked. During May several heifers were purchased, and some of them were set aside to be mechanically milked, as it was thought they would do better than older cows. It is a well enough established fact that heifers which have suckled their calves are generally very averse to let down their milk when being hand-milked afterwards, and it was thought that the same would hold good in regard to hand-milked cows when subjected to mechanical milking later on.

During May I was not at all satisfied with the completeness of the milking, and on talking over this matter with Mr Murchland, he asked me if I knew if a calf ever suckled her dam quite clean, as he was of opinion it did not. As I had not myself ever handled cows which suckled their calves, I could not tell

him from my own personal experience, and on inquiry at others, I could not get a decided and reliable opinion. All dairy-farmers who visited the farm considered it a great want in the apparatus, that it was unable to draw off the milk completely, and in that opinion it is needless to say that I coincided; but I was determined to allow matters to go on as long as possible, provided nothing serious went wrong with the cows.

Owing to the very dry weather and scantiness of pasture, none of the cows milked well during May and June; but I cannot say that any of those mechanically milked were much worse than those hand-milked. Had I not been weighing the milk of all at this time, I most assuredly would have considered that the mechanically milked cows were not doing so well as the others. Such is prejudice.

During June two cows mechanically milked took weeds in their udders, both of which I considered (rightly or wrongly) were caused by incomplete milking. About this time, I also put off several old cows which were milking very irregularly: some days they would give almost the double of others, while scarcely two milkings were alike in weight. When cows are doing so there is evidently something wrong, and as nothing else was apparent, I blamed the mechanical milking, and put them off in order to see how they would do when hand-milked. After a time these cows became quite steady in their quantity of milk, so that I am warranted in believing that when unsteady they were holding up their milk. I had not milked any heifers for a number of years, and was rather disappointed in the quantity which several of them were giving. At the middle of June I therefore, for a couple of weeks, had two of the worst milked by hand. I had purchased twelve of these heifers, and those mechanically milked had never previously been hand-milked. At the end of two weeks the one had improved only a mere trifle, while the other improved none at all: in this case, therefore, my suspicions were wrong. As far as I had gone, the best results had apparently been obtained from the heifers.

At this time I set aside two mechanically milked cows, and after a couple of weeks had the following results:—

No.		Two weeks previous to June 12.		Two weeks after June 12.	
		Mechanically milked.		Hand-milked.	
		Milk in lb.		Milk in lb.	
28.	Cow	.	.	390	413
29.	„	.	.	355	375

On June 19 two cows and three heifers, which had all along been mechanically milked, were set aside to be hand-milked for one week, with the following results:—

No.	Week ending June 19. Mechanical milking.	Week ending June 26. Hand-milking.
2. Cow . . . . .	117½ lb.	122½ lb.
3. „ . . . .	133½ „	164 „
11. Heifer . . . .	102½ „	90 „
12. „ . . . .	90½ „	95 „
31. „ . . . .	90 „	90 „

This test appeared to show that the cows mechanically milked were not giving their full quantity of milk, while the heifers, on the whole, gave fully more mechanically than they did by hand. There was also no change either in the weather, or amount or condition of the pasture, during the continuance of this experiment.

The following week cows No. 2 and 8 were still continued under hand-milking, with the result as under:—

No.	Week ending June 19. Mechanical.	Week ending June 26. Hand.	Week ending July 4. Hand.
2. Cow . . . . .	117½ lb.	122½ lb.	136 lb.
8. „ . . . .	110 „	111 „	110 „

This increase in milk is a little misleading, and not apparently all due to hand-milking, for the following cows, the same time calved as Nos. 2 and 8, had almost a similar increase, while being mechanically milked all the time, thus:—

No.	June 19.	June 26.	July 4.
9. Cow . . . . .	107½ lb.	119 lb.	117 lb.
14. Heifer . . . .	180 „	196 „	201 „
33. Cow . . . . .	207 „	212 „	198 „

Heifer 14 and cow 33 were almost continuously mechanically milked all year, they being only off short periods now and again.

On July 4 all the cows which were at that time being mechanically milked *had fallen* off in their milk-yield from that of the previous week 6.6 per cent, while all those hand-milked *gained* on the week 12.8 per cent.

This was the first very damaging statement I was able to make out against the mechanical milking, and from this forward the percentage of increase or decrease of the mechanically milked cows was calculated every week, and compared with as large a number of hand-milked cows as possible which had calved at or about the same time.

For the week ending July 11 a similar statement was made out for each lot of cows, with the following result for a fortnight:—

21 cows milked by hand for at least two weeks	gained 9.3 per cent.
8 „ „ mechanically continuously lost	6.8 „

I was now quite satisfied that it was useless to continue milking the cows mechanically, without stripping or aftering them afterwards by hand, as it was quite evident that the me-

chanically milked cows were decreasing much quicker in their milk-yield than those which were being hand-milked. This, I presume, was owing to a portion of the milk being left on the cows, as it is well known that, if a cow is about dry, the quickest way of drying her entirely off is to milk her only once a day. The mechanical milking was apparently having the same effect on the most of the cows—about one-third of them were, however, doing as well as any one could wish. If this matter is looked at in connection with Mr Murchland's question, whether or not a calf ever sucks her dam quite dry, it appears to explain the reason why breeds of cows which have suckled their calves for generations are usually very indifferent milkers.

From this time I therefore determined to hand-strip or after the most of the mechanically milked cows, and note the effect.

No.	Percentage of milk yielded mechanically.	Percentage yielded by hand as strippings.	Gain in total yield over previous week by stripping. Per cent.
5. Cow	53.8	46.2	3.4
6. " "	58.1	41.9	9.5
11. Heifer	90.8	9.2	13
12. " "	42.2	50.8	29.9
14. " "	71.2	28.8	10.8
17. " "	56.2	43.8	18
27. " "	63.7	36.3	Stripped since calving.
34. Cow	39.8	60.2	21
35. " "	46.8	53.2	14.3
37. Heifer	45.8	54.2	14.4
38. " "	56.1	43.9	14
Average	57.4	42.6	14.8

In connection with this table, it may be noted that cow 34, which has milked mechanically the worst of the whole lot, had been milked the week previously by hand. Before that she had been milked mechanically from the beginning of April, and had always done fairly well. Now, however, after a week's trial by hand, she appears to prefer the old way, and refuses to give up to the new system any more than she can avoid. I have repeatedly been asked the question whether or not cows are any more difficult to milk or strip by hand, after having been mechanically milked, than they were before. My reply is that, as far as my experience goes, there is no difference.

Cow 20, which had been milked by hand several months after calving, then three months mechanically, and then one week by hand, now refuses to give any milk mechanically. It is also worthy of note, *as showing the stage at which the invention stood at this date*, that heifers 23 and 24, which had been milked mechanically up to a week before, during which time they milked fairly well, after two weeks' hand-milking quite

refused to be mechanically milked. These heifers had never been hand-milked till two weeks before, clearly showing that of the two methods they preferred the old one. Heifer No. 11 had no strippings at several of the milkings; and if the natural production of milk of this cow during the time which elapsed between being mechanically milked and stripped—viz., from an hour to an hour and a half—be deducted from the strippings, it will be found she had been milked almost dry.

At this time I was making numerous tests of the milk of each cow in the herd, and collectively of all those hand and mechanically milked, with the result that between hand and mechanical milking I could find no material difference. The tests were made with Messrs Watson, Laidlaw, & Co.'s centrifugal testing-machine, which easily does twelve samples in three minutes. This machine works on the same principle as the separator, and records the percentage of cream, without any cost for chemicals or special skill on the part of the man working it. In order to see how much richer the strippings were than the milk yielded mechanically, I took a small quantity of milk from each cow, mixed these thoroughly together, then tested each lot separately three and four times. The average of a great many samples of the first drawn milk (all night milkings) was—mechanically or by hand—4 per cent, while the strippings were 10 to 11 per cent, of solid cream. This great difference shows the urgent necessity of milking as clean as possible.

When the milk was divided into two halves, estimated in a rough way, the first drawn half, over a large number of cows, averaged 6 per cent of solid cream, while the last half was nearly 10 per cent.

For the week ending July 25, the mechanically milked cows and heifers yielded as follows:—

No.	Percentage of the total yielded mechanically.	Percentage of the total yielded by hand-stripping afterwards
5. Cow . . . .	49.9	50.1
6. „ . . . .	58	42
11. Heifer . . . .	89.6	10.4
14. „ . . . .	63.3	36.7
15. „ . . . .	62.5	37.5
17. „ . . . .	52.5	47.5
27. „ . . . .	57.5	42.5
34. „ . . . .	41	59
35. Old cow . . . .	39	61
37. Heifer . . . .	44.4	55.6
38. „ . . . .	57.7	42.3
Average . . . .	56	44
„ previous week	57.4	42.6

The whole mechanically milked and hand-stripped cows fell on an average in their total milk-yield 2.4 per cent from the week previous, while those hand-milked fell on the average for the same time 4 per cent.

It may be mentioned, as showing one of the curious things which turn up in an experiment of this kind, that heifer 13, two years old, and small, which had always been mechanically milked until three weeks ago, now, after being hand-milked for that time, had her yield doubled from what it was when mechanical milking ceased. She had always milked easily, quickly, and quietly, and although never stripped, appeared to be almost if not entirely dry; yet her yield of milk, while going down previously, increased gradually from the day hand-milking began till this date, which turned out to be about her highest yield. This was the most extreme case I met with during the whole year's working.

During the week ending August 1, six cows only were mechanically milked regularly; several of those which had previously been so milked were put under hand-milking, while a few new cows were occasionally mechanically milked. Two milkers were off unwell; so in order to make up for their loss, several of the heaviest milking cows were mechanically milked, and those giving less were dropped off, as the same time is necessary in putting on and taking off the cans whether the quantity given is large or small. The following table shows the percentage yielded mechanically for three weeks by these cows:—

No.	Week ending August 1.	Week ending July 25.	Week ending July 18.
14. Heifer . . .	72.2	63.3	64.2
27. „ . . .	63.7	57.5	45.2
33. Cow . . .	100	100	100
34. „ . . .	39.8	41	39.8
37. Heifer . . .	49	44.4	45.8
38. „ . . .	59.8	57.7	56.1
Average of 5 cows	56.9	52.8	50.2

These figures show material improvement in the three weeks' working, but not so much as I had expected they might do. I therefore determined to continue on in this manner of working, as I was informed by Mr Murchland that he had now an improved cup-teat, a set of which I had arranged to get from him as soon as possible, and I thought that these figures would be very useful for showing at once whether or not the new cups were any improvement on those already in use.

On the week beginning August 9, I got a commencement made with a new set of teat-cups, which I will call No. 3, as from this forward much better results were obtained than previously, and in order to compare cups No. 2 and 3 with

those which followed, I give here two tables, one giving the weight of milk yielded by each cow per week, and the percentage drawn mechanically during the same time.

No.	Week, July 18.	Week, July 25.	Week, Aug. 1.	Week, Aug. 8.	Week, Aug. 15.
	lb.	lb.	lb.	lb.	lb.
14. Heifer	220 $\frac{1}{2}$	221	221	223	230
15. Cow	Not calved	136	234	274	273
27. Heifer	240	273	259	251	266
38. „	174 $\frac{1}{2}$	168	164	163	160
	Percentage mechanically.	Percentage mechanically.	Percentage mechanically.	Percentage mechanically.	Percentage mechanically.
14. Heifer	71.2	63.3	64.2	64.5	67
15. Cow	...	62.5	62.8	61.7	52
27. Heifer	63.7	57.5	45.2	53	47.7
38. „	56.1	57.7	59.8	50.3	47.5

In the first table it will be noticed that cow 14 is giving more milk than she was doing in July, although she calved on 1st May. I find also that for the past five weeks the hand-milked cows *have decreased* in their yield of milk at an average of 5.4 per cent during that time; while those mechanically milked first and hand-stripped afterwards—all of which calved about the same date as the others—are *up* .5 per cent from what they were three weeks ago. What the cause of this difference is I do not at present know, but I am quite convinced there must be some cause. The rise has taken place entirely since the stripping began, and it may have occasioned a rise of itself, or it may be that these cows are now enabled to give more milk because they were not giving so much as the hand-milked ones previously. Does this throw any light on the fact that many cows which are heavy milkers a few weeks after calving, frequently do very poorly later on, while most cows which give a big annual yield apparently make such up by yielding a moderate quantity at first, and keeping it up steadily for a longer period?

The working with cup No. 3 for the week ending August 22 did not show any improvement. The following table shows the results with it:—

Cow No.	Week August 22. Total yield.	Week August 22. Per cent mechanically.	Week August 15. Per cent mechanically.
14 . .	203 lb.	66.5	67
18 . .	304 „	70.1	not tested
27 . .	245	45.3	47.7
12 . .	319	100 not stripped	30 lb.
33 . .	175	100 „	179
32 . .	161	100 „	uncalved



Cup No. 3 had a very feeble hold on the udders of the cows: it allowed a portion of air to enter, which, of course, necessitated more pumping, while the results obtained were, on the whole, scarcely so good as those with pattern No. 2. For these reasons I was about to discard it altogether; but having a letter from Mr Murchland saying he expected to be able to send me another and better set by the end of the week, I decided to give them a third week's trial.

The third week's trial of cups No. 3 had the following results:—

Cow No.	Total milk yielded.	Percentage yielded mechanically.	Previous week with same Cups.	With Cups No. 2.
12	307 lb.	80	319 not stripped	301 not stripped
14	208 "	63.8	66.5	.67
18	268 "	62.6	70.1	no record
27	238 "	49.5	45.3	47.7
32	201 "	70.7	161 not stripped	uncalved
33	151 "	not stripped	175 not stripped	179 not stripped

From this table it will be seen that on neither of the cows 14 or 27, which had been milked with cup No. 2, did No. 3 on three weeks' working show any advantage.

The next week cups No. 4 gave the following results:—

Cow No.	Total Milk for week September 5.	Percentage yielded mechanically.	Average, two weeks. No. 3.	Last week. No. 2.
12	310 lb.	79.4	80*	no record
14	201 "	66	65.1	67
18	219 "	65.8	66.3	no record
27	279 "	47.1	47.4	47.7
32	263½ "	63	70.7*	uncalved
33	167 "	96.7	not stripped	not stripped

This cup shows no improvement on either No. 3 or No. 2.

A new set of cups—No. 5—having arrived during the week, they were tried the week following, with the result as under:—

Cow No.	Total milk for week September 12.	Percentage yielded mechanically.	Total milk yielded September 5.	Percentage yielded mechanically.
12	304½ lb.	84.5	310 lb.	79.4
14	187½ "	79.7	201 "	66.0
18	232 "	64.8	219 "	65.8
27	266 "	68.6	279½ "	47.1
32	271½ "	72.7	263½ "	63.0
33	160½ "	98.4	167 "	96.7
Average	...	78.1	...	69.6

Cups No. 5 therefore showed a gain of 8.5 per cent on the previous week's working, which was about the average of all the time previously. Cow 18 appeared to be very difficult to manage, while 27 was not much better. Both milked very irregu-

\* For one week only.

larly: the one time they would have very little strippings, while the next they had double or even triple. Cow 18 was very timid, while 27 had very sore teats, which, however, were improving. It was also noticed that after cups No. 5 there was scarcely ever a hard teat, even when put on a cow for the first time.

The next week cup No. 5 gave the following results:—

Cow No.	Total milk for week September 19.	Percentage yielded mechanically.	Percentage yielded previous week.
12 . . . . .	305½ lb.	87.2	84.5
14 . . . . .	200 "	80.5	79.7
18 . . . . .	233 "	67	64.8
27 . . . . .	250 "	72	68.6
32 . . . . .	276 "	76	72.7
33 . . . . .	164 "	100	98.4
Average . . . . .	...	80.4	78.1

This table shows a gain on the previous week of 2.3 per cent, or a total of 10.6 per cent over the cups in use two weeks before.

The results of the following week's working were as under:—

Cow No.	Total milk for week September 26.	Percentage yielded mechanically.
12 . . . . .	261 lb.	88.5
14 . . . . .	150 "	80.7
18 . . . . .	205½ "	64.7
27 . . . . .	230 "	67.6
32 . . . . .	246½ "	75.6
33 . . . . .	151 "	100.
Average . . . . .	...	79.5

The percentage yielded mechanically the previous week being 80.45, there was a loss of above 1 per cent this week. This loss was, however, more apparent than real, for the weather being wet and stormy, the cows had all fallen off more than usual, and as the strippings remained practically the same, or even less, my attention was drawn to the fact that the percentage system was not after all so accurate as I had considered it to be.

The following week I left three of these cows unstripped, with this result:—

The yield of the three cows mechanically milked fell off on an average from that of the previous week 12.8 per cent, while the yield of those mechanically milked first and then hand-stripped fell off on an average 14.3 per cent.

The falling off of both lots is accounted for by the rough weather.

The next week cow 32 was hand-stripped, but 12 and 33 were milked as they had been the previous week,—the results in every case being about the same as for the week or two previous.

On the week beginning October 25, cows 12, 14, and 18 were set aside to be hand-milked, in order to see how their yield of milk would compare with what it was when they were mechanically milked first and hand-stripped afterwards. At the end of two weeks it was found that they had fallen off during that time 18.4 per cent, while 27 and 32, which were first mechanically milked and then hand-stripped, had only fallen off 9.6 per cent during the same time. This was the second occasion on which I had found an almost similar result with a different set of cows. The following week, cows 27 and 32 were hand-milked, while 12, 14, and 18 were first mechanically milked, then hand-stripped, when the yields were entirely reversed, the hand-milked cows again falling off 16 per cent in one week, while those mechanically milked and hand-stripped fell off only .4 per cent. For the seven cows mechanically milked for the week ending November 14, the average percentage yielded was 83.3. Being, however, convinced that the percentage method was not the proper one to go upon, I had for the last few weeks been devoting my attention principally to the strippings.

The following table shows the total yield of milk and strippings in pounds for the past three weeks, which are the best hitherto obtained. It is also worthy of note that these cows were not stripped until at least one hour after milking, so that, if the natural increase during that time was deducted, the amount left on the cows was very little indeed. These results were obtained by an ordinary byreman, without any special care on his part, and without any training, as he only entered any employment two months before:—

Cow No.	Total milk, mechanically, for week Nov. 7.	Strippings for week Nov. 7.	Total milk, mechanically, for week Nov. 14.	Strippings for week Nov. 14.	Total milk, mechanically, for week Nov. 21.	Strippings for week Nov. 21.
	lb.	lb.	lb.	lb.	lb.	lb.
12	184½	...	183½	27½	180	26
14	84	...	98	26	hand-milked.	...
16	284½	34½	290	28		27½
17	242	47	231	35		25½
18	142	...	126½	30		42
21	217½	36	219½	30½		23½
23	228	45	229½	26½		27½
27	153½	40	125½	...	144	42
32	202½	38	173½	...	156	40
1	...	...	...	...	177	55
Weekly average		40	...	29	...	29.9
Average per milking		2.85	...	2.07	...	2.1

The results for the week ending November 21 are very

much better than they look from the tables, for all the cows which had been hand-milked the week previous had a double quantity of strippings for at least the first half of the week, as will be seen by the table given below. If these cows are rejected, and only those taken which have been mechanically milked at least two weeks in succession, it will be found that the average strippings are only a trifle over 2 lb. each time; while, if cow 18, which has never milked well, be put out, the average of the remaining five cows is 1.85 lb. During the week these cows gave, on an average,  $36\frac{1}{2}$  lb. daily, which is a production of  $1\frac{1}{2}$  lb. per hour. One hour fully, at least, elapsed between the milking and the stripping, it not being convenient to do so earlier—so that, if  $1\frac{1}{2}$  lb. be deducted from the daily strippings of these five cows, it follows that only about  $\frac{1}{8}$  lb. of milk was left on each after the mechanical milking.

Strippings yielded each milking by cow 32, one hour after being mechanically milked, this cow having been hand-milked the week previous—

7, 4, 5,  $4\frac{1}{2}$ , 3, 2, 2      2, 2, 2,  $1\frac{1}{2}$ , 2, 2, 1 = 40 lb.

The first half of the week she gave  $27\frac{1}{2}$  lb.

The second      „      „       $12\frac{1}{2}$  „

If these results are compared with those obtained from the same cows three months before, it will be seen what improvement has been made. It may also be noted here that at the beginning of November cow 33 was removed into another byre, which was not fitted up for mechanical milking, as she was at that time giving so little—5 to 6 lb. at each time—that it was not considered worth while keeping her filling up the place of another giving as much in two days as she was doing in a whole week. This cow had been milked all along ever since the milking apparatus was erected, and nearly the whole time milked very well. She was milked by hand for a few weeks before the apparatus was put up, and was put on it because she was very difficult to milk by hand. Several of the other cows mechanically milked were also of this nature. For a few weeks at first I was afraid she was not being milked very clean; but during odd weeks now and again throughout the year, as will be seen from the tables, she was hand-stripped, though rarely ever giving anything worth taking notice of.

During the week ending November 28 the milking apparatus was handled by a lad of sixteen years who could not milk; and whether the cans were taken off before the cows were thoroughly dry, or from some other cause, I am presently not

prepared to say, but the strippings increased from an average of 2 lb. to fully 3 lb.

Hand-strippings of mechanically milked cows for week ending November 28, 1891:—

No.		lb.
1.	. . . . .	57 $\frac{1}{2}$
12.	. . . . .	32 $\frac{1}{2}$
14.	New cow, just calved . . . . .	37
16.	. . . . .	37 $\frac{1}{2}$
17.	. . . . .	44
21.	. . . . .	37 $\frac{1}{2}$
23.	. . . . .	37
32.	. . . . .	43
33.	. . . . .	73
Milking average . . . . .		3.1 lb.

Cow 33 is one recently calved, with very small teats, and extra slow to milk. This is her first week of being mechanically milked, and, like cow 32 mentioned on the previous page, about two-thirds of the total strippings were given during the first three days of the week.

On November 28 a new byreman took charge of the apparatus, the old one remaining about the farm, but in a different capacity. The first day or two the results obtained were not so good as previously, but after that they were just about the same as before, viz., about 2 lb. each. At one of the milkings, the whole strippings from six cows was 6 lb., and with time or plenty of cans, about that result may be obtained from many cows. With me the morning's milking has to be done particularly hurriedly, and there is no time to put off waiting till the very last drop of milk comes. With, however, power to drive the apparatus, and a sufficiency of cans, the last drop may in many cases be taken away.

For the week ending December 5, the average for seven cows (all that were being mechanically milked) was 1.9 lb. of strippings each time. This is the lowest average of strippings yet obtained, the stripping being still one hour or so after milking; and when the natural production of that hour is deducted, very little can have been left on. During the past week, as soon as the udders began to be about emptied and to have a shrunken appearance, the cups were eased off and given a new catch, it having been found that by doing so a better vacuum was preserved, more milk was drawn, and less pumping was required. Cow 33, which a couple of weeks before had double the strippings of the average of the others, is now the second lowest. This cow having a very small teat, was difficult to milk by hand, but mechanically she takes about the average, viz., seven to eight minutes.

Undernoted are the average strippings for seven cows for the following weeks:—

Week ending	lb. each time.
December 12 . . . . .	1.9
"    19	1.85
"    26	1.5
January 2	1.6
"    9	1.2
"   16	1.3

During the week ending January 9, except one cow, all the others averaged 1 lb. each time. At the beginning of following week one of the best milking cows was removed and another put in its place, the new cow having an average of 2 lb.

The year's experiences may be shortly summed up thus:—

The apparatus as at first sent out, although milking fairly well, did not milk sufficiently clean to satisfy the average farmer. At first, also, cows which were hand-stripped after being mechanically milked, kept up an unusual quantity of their milk, showing that they preferred hand-milking.

With the latest improvements, hand-milking does not interfere with the mechanical milking, the cows taking alike kindly to both systems. Where hand-milking is in any way difficult to accomplish, mechanical milking may be tried without any anxiety as to the result. If at all possible, some mechanical motive-power should be used, as gravitation water, a hydraulic ram, water-wheel, hot-air engine, gas-engine, electricity, steam-engine, or with an American set of driving gear, or a pony might be set to do the milking. No one at all interested in the working of the apparatus need have any fear of being unable to do good work, and even attain better results than I have, as, owing to my byreman leaving at midsummer, no thoroughly qualified man was there till Martinmas.

## THE AMERICAN CHILLED PLOUGH IN COMPARISON WITH THE SCOTCH SWING-PLOUGH.

By JOHN BARCLAY, Cowfords, Banff.

IN writing upon this subject, I shall just simply state what has been my own experience over seven years, in which I have wrought both ploughs, upon a farm composed of both heavy and light soil.

1. *As to the quality of the work.*—On stubble-land the chilled plough turns in the surface far better than the common plough. It is a great deal better broken, and remains very loose, so that the frost goes farther in to pulverise the soil; and when the

harrows or grubber are used in spring, it is very much more easily worked into a fine mould, saving about a third of the labour, which in the busy season is a great advantage. For ploughing in dung spread upon the surface, the chilled plough does it to perfection. On lea at first I tried small pieces on different parts of the field, and as the results were satisfactory, I took to ploughing most of it, as it was easier harrowed. I have had a difficulty in ploughing cleaned land after the drought set in in spring, where the turnips had been covered up with the drill-plough in autumn, unless I ploughed across the drills, which is not always convenient. With that exception, the chilled plough does cleaned land well. It is said they will not do in wet land, because the water will not sink below the furrows, and the soil will get consolidated. I never had any difficulty in this respect. All I can say is, if we depend upon any kind of plough to dry wet land, we will have but a sorry return for our labour. But I have seen work performed by the chilled plough that I would not have at all—work which looked more like a field almost harrowed rather than newly ploughed; and I have seen it so roughly done with holes left open that one could see the bottom of the furrow. To be rightly done for cropping, the furrows should tell from end to end, but at the same time be thoroughly broken and left loose. This can easily be done by a man who understands how to set the skim-point and pressers to the kind of soil and the size of the furrow he is taking. Some think that any one can work a chilled plough; but if a ploughman does not give it his attention, as well as a steady grip, he will not make good work with a chilled plough, even though it is easier held—and I maintain the chilled plough is easier held, if properly set for its work. Another point in favour of the chilled plough is that it lifts up the furrow, whereas the swing-plough presses it against the last furrow, hence the loosening of the land and the light draught. The swing-plough is best adapted for stony or rocky-bottomed land. Firstly, because it is heavier, and narrower in the sole or feather of the sock, and therefore not so easily turned out of the furrow. Secondly, the sock being wrought-iron, is not so easily broken as the chilled socks are, and many breakages become expensive. One objection I have to the swing-plough at present in use is the shape of the furrow, it being set up so far above the square that the furrows are wedge-shaped, and must have an unequal bottom or a deceptive depth when turned over—generally both. The chilled plough leaves the sole of the furrow quite flat, so that the land is all turned the same depth, whereas the swing-plough is from  $1\frac{1}{2}$  to 2 inches deeper at the sole-track than it is at the bottom of the board. The boards on swing-ploughs are so long that the furrows are scarcely broken, which prevents

the frost getting in so well, and therefore the land is not so easily harrowed.

2. *As to the effect upon after-crops.*—In my experience I never knew any perceptible difference—that is to say, if the ploughing was properly done and well harrowed, I could not tell one ridge from the other. Some say that is because I put in my seed with a drill-machine; but I tried a field, sowing it with my hand, and there was no difference of the crop all over the field. I saw a neighbouring field in 1890, one-half of which was ploughed with the chilled plough, the other with the swing. The chilled part was more unequal in ripening. I passed the same field when newly ploughed, and it was very badly done—you could have put your foot to the bottom of the furrows in some places. In this case the ploughman was entirely to blame, not the plough, and it was not to be wondered at that the field was unequal in ripening.

3. *As to a comparison of draught.*—I have tried the draught of both the swing and chilled ploughs in the same field by the dynamometer. The field was stubble, of light soil at the one end and stiff at the other. The average indication of Howard's chilled plough was  $3\frac{1}{2}$  cwt., the average of the swing-plough was  $4\frac{1}{4}$  cwt., a difference of  $\frac{3}{4}$  cwt.; but at the stiff end the swing-plough rose more in draught than the chilled one did. The depth of furrow was from 7 to 8 inches; the chilled furrow was from 12 to 13 inches in breadth, and the swing from 9 to 10 inches. I have tried heavier ploughing with both ploughs than this, and find that the swing-plough gives a higher reading of the dynamometer in proportion to size of furrow than the chilled plough. This may be considered too heavy ploughing for lea or cropping, but it is good autumn ploughing for cleaning. I never had an opportunity of testing Oliver's chilled plough, but I believe it is considerably lighter in draught than Howard's.

4. *As to the cost per acre.*—It is not so easily arriving at the cost exactly, but the price of the ploughs and the amount of work performed by each respectively will be a fair comparison. A new swing-plough costs from £4, 10s. to £5, 10s., the chilled plough from £3, 10s. to £4; average difference in favour of chilled plough, £1, 5s. The smith's work for the swing-plough, for new socks, &c., costs from £1, 10s. to £1, 15s., while the chilled plough will cost about 16s. to remetal. Here is 16s. in favour of the chilled plough, and the chilled metal will wear longer than the steel or iron of the swing-plough. A share and skim-point of Howard's at 2s. 3d. will plough as much as 5s. value in sharpening and laying of socks and coulter of swing-plough. The amount of work performed depends upon the kind of soil and the power and speed of the horses; but I find the



work well done at the proportion of 3 to 4—that is to say, if the swing-plough turns over 3 acres in a given time, the chilled plough will turn 4 acres, travelling at the same rate. Or say, if the swing-plough does an acre for 10s., the chilled plough will do the same for 7s. 6d. Then there is no time lost in travelling to and from the smithy with the chilled plough, and the value of time in money is always increasing.

To conclude. In my opinion a fair comparison of the work done, the saving of labour, the difference of draught, and the expense of keeping up, will prove that it is a great advantage to use the chilled plough wherever the soil is not too bare or stony. I am aware there is strong prejudice against the chilled plough, but it springs from sources which I believe the present age will overcome.

---

## ON PRODUCE FARM RENTS.

By T. W. LORIMER, Newton-Stewart.

LET a subject on any branch of social economy have what importance it may, unless the questions which it involves press for immediate solution, or it has other means of getting into the swim of public discussion, the odds are heavily against its attracting much attention, no matter how it is handled. My subject having at present no such backing, I am quite prepared for the number of my readers being very limited. I will feel satisfied, however, if I can put on record some suggestions which, when the adjusting of rents may have again become as burning and troublesome a question as it was a few years ago, may assist parties in leasing land on terms more likely to continue equitable than fixed money payments.

Rent, in its widest sense, is the amount payable to the owner of any subject by another party for the temporary use of it. We say temporary, because perpetuity, even though extinguishable by failure to pay rent, infringes on ownership. Land and buildings are, however, almost the only subjects to the use of which the term “rent” is generally applied—freightage or charter-money being applied to shipping; hire to the use of horses, carriages, furniture, &c.; interest to that of money; and fees, salary, or wages to brains and muscles. Though all these payments belong in a sense to the rent family, it is only with farm rents that we have now to deal.

Although the primitive system of payment in kind, or in share of produce, or the more advanced one of paying a share,

say a third, of the converted value of its produce for the use of land, still prevails in some parts of Europe and elsewhere, yet of late years British farms have been almost universally let on fixed money rents. The rapid and great fluctuations which have taken place in the prices of farm produce at several eras during this century, causing often when downward a greater strain on the moderate capital of tenants than it was fit to bear, and perhaps still more the wild competition for farms, and the excessive rents offered after a few years of good profits, with the prospective impossibility of exacting these high fixed money rents after a series of bad years,—these various disorganisers of farming returns, and of the rent equitably due therefrom, have frequently made parties having to deal with the letting of farms—both as lessors and lessees—anxious to establish a practical system of produce rents, whereby the proprietor should, without encroaching on his tenant's freedom of action in cropping and otherwise, share partially with him in both those losses and gains which are independent of his skill, industry, or capital. That such is *prima facie* a desirable object of attainment, I think few of even those who are inclined to laugh at the idea of produce rents as visionary will deny. The more specific arguments in favour of the system will be considered towards the close. I do not however maintain that any form of fluctuating rent is likely to come ever so generally into use over the whole country as fixed money rents, and even where there is a wish to adopt a produce rent, I think it should only be done partially—a proportion of the rent, varying from about a sixth to a third, being always in fixed money, and that is the portion which I would leave it to offerers to name.

The objects aimed at by produce rents were to some extent attained in several of the chief grain-growing districts of Scotland during a series of years in the first half of this century, by regulating rents wholly or partly by the county fiars prices of grain. Of late years, however, since returns from even the best grain farms have become fully as much dependent on stock—along with in some cases potatoes—as on grain, these grain rents have almost quite lost their applicability to the emergency.

The question, therefore, which now presents itself is this, Would the addition of average prices of the other chief articles sold off farms to the fiars prices of grain now form sufficient data for produce rents? It is pretty obvious that it would not. The other data which would still be required for establishing covenanted produce rents which should conform thoroughly to the natural rent are of two very different classes. The first consists of the *annually varying quantities of each crop grown per acre over each county*, such variation being almost entirely caused by the weather over the county where the farm is

situated on the county crops, and *inferentially so far* on the crops of the farm itself. The climatic influence determining to a great extent the bulk and quality of crop grown, I hold to be even a more essential element in a produce rent than is the influence of the markets, seeing that the former is fully more beyond the control of both proprietor and tenant than the latter. Nor is the introduction of these data in the least degree impracticable. All that is required is to combine the average quantities grown with their prices, or, in other words, to take as a guide to the rent the average value per acre of all crops over the county, or of such of them and in such proportions as the parties might agree to select when the farm is let.

The second class of data to which I have alluded, though exercising a strong influence on the farmer's net returns, out of which his rent must be paid, and also being matters over which his control is very limited, are yet such as I hold *ought not to be adopted* in framing a produce rent, they being just those portions of the expenses and casualties of farming which, though unavoidable, fall most naturally entirely on the tenant. I allude, of course, to labour expenses and the cost of manures and feeding-stuffs. If such were, however, to be enlisted into the calculation, let us see how it could be done. Seeing that the greater these and other expenses are the smaller is the balance for rent, it seems a mere truism to remark that they would form negative regulators. The simplest way of doing so, then, seems to be this: Let an annual tariff of the county farm-servants' wages, and of prices of leading manures, &c., be published, and, guided so far as he chooses by that at the date of entry, let the farmer increase his money offer by such a sum as would that year correspond to certain of these charges, but on condition that there should be annually deducted from his rent that year's county tariff of corresponding charges as then should be specified in the lease. However, as indicated above, I do not advocate at present such an attempt to follow out in practice in that direction the theory of a strictly correct natural rent. The position I take up is therefore this, that for a workable system of produce rent we only require as regulators the averages of acreable quantities and of prices—or, in other words, the average gross acreable returns over the county of such products as we wish to adopt as guides. Now, how far are these already supplied? The annually published Government returns of the acreage and of the quantities grown per acre of all our crops may, we presume, be held to suffice for the whole quantitative data, whilst the fairs court returns supply the data of price so far as grain is concerned. There remain only to be ascertained the value per weight or measure of the roots and of hay, and some estimate of acreable returns from pastures, when, as perhaps for dairy.

farms, it may be thought that these should not be entirely represented by fixed money rent.

On a superficial view of the subject it may be thought that besides, or preferably to, these last inquiries should be one as to the prices, either by live or dead weight, of cattle and sheep, and of dairy produce; but as the amount of these, *so far as they are products of the farm*—and we would eschew the produce of bought food as connected with rent—depends on the root and grass crops, it seems to me more satisfactory to rest the portion of rent derivable from winter feeding of stock *on the return from roots*, to be tested as after proposed and explained, and that most of that portion corresponding to the grazing returns should be payable—except perhaps on dairy farms—by fixed money rent. It is true that in estimating the value per ton of turnips the market price of the beef or mutton and cheese or butter which they produce must be taken into account, and therefore it might seem at first sight better to take these meat prices at once as the rent indices; but when it is considered that the *quantity* produced as well as the price must be brought within the purview, I can't see how that can be done except upon green crop valuations per acre.

Experiments in feeding have led to pretty reliable general conclusions as to what weight of swedes, along with a fair proportion of good fodder, should produce a certain weight of beef, &c. These results must vary very much according to treatment, age, and breed of stock, &c.; but it is only the general and no special condition we want to build upon, and the same estimated results being adopted each year would bring out the *relative returns* of one year as compared with another (all that is really wanted) as reliably as if strictly correct. I shall state the results of feeding proposed for guidance further on.

Supposing a certain weight of beef or mutton per ton of turnips, and (through the Government turnip weight returns) also per acre of turnips, to be thus ascertained, it still remains to fix its value. For this end it would be necessary that the statements already being weekly supplied by the leading cattle salesmen should be collected and collated for the whole year, and then the average of these rates, although not specially applicable to counties, when combined with the county turnip weights, would give the results required for each county.

As to dairy farms. The average county dairy produce of each cow might be ascertained, and rents based thereon, coupled with the price of cheese; but this system would be faulty in this respect, that when either the turnip crop or grass is very deficient—as the latter was on the dairy farms in the south-west of Scotland in the summer of 1891—farmers either reduce their stocks or give their cows a great deal of artificial food, so

that the deficiency of milk per cow, even though still considerable, does not at all fully represent the loss from the short crops of grass or of roots. It therefore seems to me more trusty to place the rent from grazing of dairy farms on the acreage of pasture than on its produce of cheese or butter, though the latter must be ascertained to determine the former, as specified further on.

The county average money returns per acre for the various grain as well as green crops being published, it would lie at the doors of those chiefly interested to apply them to the use intended. It would be very proper for such a body as the Highland and Agricultural Society, besides arranging official collation of the statistics, to signify its approval and commendation of produce rents on a scheme to be formulated as definitely as would be prudent, but that would be all the length the Society as a body could go. It would seem to prove, however, that the Society was very half-hearted in the matter, if, seeing that it embraces almost all the landowners and most of the land agents in the country, none of these should adopt the system they had joined in recommending. It will be understood from what I have said that I do not at all contemplate offerers for farms taking the initiative in this matter—indeed, I don't even expect the system to be liked by them at first; yet I feel confident that were a desirable farm advertised for letting partly on a produce rent there would be plenty of inquiries for it, and that though many of them might try to pooh-pooh the produce idea, if the agent would stick firmly to his guns he would easily let the farm, and in after years would probably have gained the thanks of both proprietor and tenant.

An advertisement of such a farm might be framed somewhat thus, after a description of the farm: "About [*here state approximately the proportion*] of the rent will be in the acreable value of farm produce as regulated by the county averages. The extents of each kind of crop to be paid, on conversion, as rent to be shown and explained to intending offerers by the agents, and the offerers then adding fixed money rent according to their own judgment."

Before dealing with the details of such schedules as might be shown to offerers, I must now state the estimated feeding capabilities of swedes, by which I propose to arrive at the weight of beef per swede-acre. My assumption, which, though I think not very wide of the truth, is made more for illustration of the system than as claiming correctness, is that 1 cwt. of swedes ought to produce  $1\frac{1}{2}$  lb. of beef (live weight), or 1 lb. cheese or  $\frac{1}{2}$  lb. butter. Then, in the event of the market value of any one or each of these weights of produce being 6d., a crop of swedes of 16 tons per acre would be worth exactly £8, or 10s. per ton.

It will be observed that the above price (4d. per lb.) corresponds to 37s. 4d. per cwt., which is pretty nearly the recent average value live weight of ordinary beef, whilst 6d. per pound for cheese (wholesale) and 1s. per lb. for butter may not be very far from recent Scotch rates. I believe that 1½ lb. of beef (live weight) from 1 cwt. swedes may be generally thought rather too low an estimate, seeing that good feeding oxen frequently gain from 3 lb. to even 4 lb. per day, consuming from 1 to 1½ cwt. roots; but as nearly the half of that gain is usually due to cakes or meal, as no deduction is here made for attendance, &c., and as at any rate it is safer to act on an under than an over estimate, I think such a moderate scale ought to be acceptable to proprietors, and still more so to tenants.

It will be understood, then, that as guiding all these valuations of swedes, *I propose to adopt some fixed and permanent standard for the feeding capabilities of swedes of normal quality under normal circumstances.* What the proper standard is would be well worth inquiry. Yet however much care might be taken in fixing it, no doubt many an offerer might think the rule inconsistent with his own experience. If so, however, all that such an one would have to do, in order to adjust the rent to his own views, would be to modify his money offer accordingly.

I must now offer a few remarks as to the valuation of the potato crops. Although there is no crop for which a produce rent would be more suitable than potatoes, unluckily there would be at the outset this difficulty, that there are no collected statistics of prices per ton, and perhaps there is a wider range in these prices for the different localities than in the case of any other crop, whilst there is no practical way of testing their normal value by their feeding powers as with turnips, seeing that it depends so much on the part they play in our infinitely varied cookery. It occurs to me, then, that the most reliable way of getting a near approach to the average acreable value of the potatoes grown in each county would be through the reports of two or three of the leading growers in each parish. Let the county councillor for each parish issue circulars to the two or three chief growers in his parish, asking each to state not his gross receipts, but the receipts per ton for his whole crop as delivered at the nearest town or railway station, and including therein small and diseased potatoes if sold, or when used at their value, and also good potatoes used at a similar rate, in proportion to quality, to those sold. These returns being collated by the councillor with reference to the quantities to which each refers, should be sent to a county collector of such statistics, and then the amalgamated price per ton, collated with the returns to Government of the acreable weight of crop, would bring out the county average value per acre.

Should the average price of hay be wished in any county where it is extensively sold, the very same form of procedure as to it might be followed, and a somewhat similar one as to pasture in dairy counties.

As moderate payment ought to be made to both collectors and reporters of these averages, should Government not allow it, county councils should impose the very small extra rate required to meet it.

Before offering his money rent in addition to the convertible produce stipulated for by the letting agent, an intending offerer ought to examine and consider well what had been the previous year's county averages of the crops specified, so as to form a safe opinion as to what difference might be expected between such county returns in future, and those which he could feel safe in calculating on from the farm in question.

I must now introduce with a few explanatory remarks illustrated schedules for such produce rents as might—some one for each farm—be shown to inquirers, and it appears to me best and most easily adaptable to farms of any size to give them for extents of 100 acres each. I shall try to suit the crops, as well as can readily be done without too much detail, to several classes of farms, thus:—

1. *Farm of light and somewhat inferior land*, and without any unusual local advantages, suitable for a rotation embracing two-sixths grain crop (mostly oats), one-sixth green crop, and three-sixths grass, and for which a fair rent might be stated at present at 15s. per imperial acre.

2. *Farm of good medium quality of light land*, suited for the ordinary five-course rotation. Two-fifths grain (oats and barley), one-fifth green crop—nearly all turnips—and two-fifths grass. This class might be subdivided into (a) stock-breeding farms, (b) feeding farms, and (ab) farms where breeding and feeding are combined. Both cattle and sheep are generally kept on all. However, as the county valuation of the turnip crop ought to form the chief basis of rent for all these kinds of stock, so far as their winter feeding is concerned, these subdivisions may be dispensed with. I state the rent of these farms at 25s. per acre.

3. *Dairy farms*. Although these might also form a branch of the former class, being generally of a similar quality of land, I give them a separate column. As they depend fully more than any other arable farms upon pasture, I propose to lay a good part of the rent derivable from it (the pasture division, which I take as occupying half of these farms, though in some cases it extends to only two-fifths) on an annual valuation of pastures, in place of leaving that portion, as in other farms, to be paid entirely by fixed money. The valuation of such pastures all over a county would doubtless be one of the very most

difficult parts of this scheme. The variety of quality is so great that I scarcely think all could be fairly embraced. The only system on which I think a tolerably fair pasture-rent basis could be established would be to take statements of their grazing returns from two or three of the chief farmers in each parish, in a similar way to what I proposed as to potatoes. Although these limited returns would likely be all rather above the county average, yet these farms being made known to offerers of produce rents, their annual returns would form quite as good, if not better, guides as would returns from the whole county. Such a limited system of average returns might possibly also be applied with good results to the grain and turnip crops; but I see no good reason at present for so setting aside the Government averages and the county fairs prices of those crops. The initial rent I put on these dairy farms is the same as those under column 2—viz., 25s. per acre.

To fix the system on which these estimates of returns from dairy pastures ought to be made is by no means one of the minor difficulties in this inquiry. I would propose to do it somewhat as follows. Suppose a cow to yield 3 cwt. of cheese *from the summer's grazing, not including any produced by other food*. That weight at, say, 56s. per cwt. comes to £8, 8s. How much extent of grass is required for this? According to the quality of pasture, it may vary from under an acre to  $2\frac{1}{2}$  acres, and it may also vary up to fully 30 per cent, according to the season. When  $1\frac{1}{2}$  acre suffices, a gross return per acre of £5, 15s. 4d. at above price for cheese would be obtained. But of this how much must be deducted for the difference in market value betwixt the cow in full milk in spring and the same cow nearly dry in autumn? Putting this difference at £4, the relative deduction per acre would be £2, 13s. 4d. Besides this, however, although I would not deduct any expenses of production or costs of marketing, not having done so as to other crops, I think a further deduction should be made for casualties to stock and keeping up of fences. Putting these together at 10s. per acre, we have to deduct £3, 3s. 4d. per acre from the gross return of £5, 15s. 4d., leaving a reduced return of £2, 12s. per acre. These may be very wide of most dairy-farmers' experiences, and if so, I hope widely under them; but if the principle of valuation should commend itself for their acceptance, that is all I aim at.

I have already shown that laying the rent directly on the produce of each cow would not be satisfactory.

4. *Farms of strong land*, especially carse clays, suited for wheat, and generally cropped on a four-course rotation, two-fourths being grain, one-fourth fallow crop (about half thereof being beans and bare fallow and the other half turnips, rape,



&c.), and one-fourth hay and soiling clover and rye-grass. Since wheat has been so very low-priced, these farms have been less in demand than any other class. I put a present rent of 28s. per acre against them.

5. *Farms of good productive land in good localities*, and suited for potatoes. A six-course rotation, with three-sixths grain, two-sixths fallow crop, and one-sixth hay, was formerly, and is partially still, the common cropping for such farms; but since grain fell so much in price, on many such farms a second year's grass is introduced, partly for sheep. Thus an average between these six and seven years' rotations (forming, if alternated, a thirteen years' course) might perhaps be best chosen as a standard for these farms. Varying in rent from 30s. to 60s. per acre, without including the best farms very near great cities, the average rents for this class may be stated at 44s. per acre.

The following tables being framed only for illustration, the prices on which they are based have no claim to accuracy, though they approximate to our recent rates. Oats are estimated at 38 bushels per acre and 2s. 6d. per bushel; barley at 34 bushels per acre and nearly 3s. 3d. per bushel, with a slight addition in column 5 to these figures for both grains; wheat at 32 bushels per acre and 4s. 6d. per bushel; turnips, 15 tons per acre at 10s. per ton; and potatoes,  $6\frac{1}{2}$  tons per acre at 40s.; hay at from 84s. to 90s. per acre; and pasture at 52s. per acre.

I may further remark as to these simple tables, that all I claim for them is, that they may give a crude idea of how very much more extended and more accurately framed ones might be issued under the auspices of such a body as the Highland and Agricultural Society, and at the same time how even such very short and simple figuring as their columns show, would quite suffice for reckoning up a produce rent suited to almost any farm. Even more elaborate tables, however, could only be expected to act as helps to private parties in arranging their bargains. The only rates to be strictly adopted would be the annually published county averages, whilst the choice of crops and their extents would, of course, be entirely at the option of contracting parties before being inserted in the leases. It is very hazardous to name prices for any of our farm products as being likely to be nearly those which will rule in future; but every offerer has that same difficulty when estimating what rent he should promise, and it ought to be a satisfaction for him to be relieved so far from the great additional hazard annually caused by the variable seasons over the county, and inferentially on the crops of his own farm. The difficulty of choosing proper prices, or even a proximate approach to them, is at present felt especially as to wheat and potatoes.

TABULAR STATEMENT for PRODUCE RENTS, suited to farms of various classes, in divisions of 100 acres each. The rates to be in practice those of the averages of the counties in which the farms are situated, and for that year's crops for which the rent is payable. The illustrative rates given are a rough estimate of crops 1890 and 1891 for SCOTLAND generally, the slightly higher rates for Barley, Oats, and Hay in column 5 referring to farms in those counties (LOTHIANS, &c.) where these crops usually exceed average prices.

CROPS AND MONEY.	1. Inferior land, about 10s. per acre.				2. Medium land, 25s. per acre.				3. Medium dairy farms, 25s. per acre.				4. Clay farms, 28s. per acre.				5. Fertile potato land, 44s. per acre.			
	Acres for rent.	Rate, Crop 189-.	Amount.	£ s. d.	Acres for rent.	Rate, Crop 189-.	Amount.	£ s. d.	Acres for rent.	Rate, Crop 189-.	Amount.	£ s. d.	Acres for rent.	Rate, Crop 189-.	Amount.	£ s. d.	Acres for rent.	Rate, Crop 189-.	Amount.	£ s. d.
Wheat .	...	...	...	...	...	...	...	...	...	...	...	...	6	144s.	43 4 0	4	144s.	28 16 0		
Barley .	...	...	...	...	5	110s.	27 10 0	...	...	...	...	...	2	110s.	11 0 0	4	120s.	24 0 0		
Oats .	6	95s.	28 10 0	...	6	95s.	28 10 0	...	8	95s.	38 0 0	...	6	95s.	28 10 0	6	100s.	30 0 0		
Turnips .	8	150s.	22 10 0	...	4	150s.	30 0 0	...	3	150s.	22 10 0	...	2	150s.	15 0 0	4	150s.	30 0 0		
Potatoes .	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	260s.	52 0 0		
Hay .	...	...	...	...	...	...	...	...	...	...	...	...	2	84s.	8 8 0	4	90s.	18 0 0		
Pasture .	...	...	...	...	...	...	...	...	14	52s.	36 8 0	...	...	...	...	...	...	...		
Fixed money	...	...	24 0 0	...	...	...	39 0 0	...	...	...	28 0 0	...	...	...	34 0 0	...	...	37 0 0		
Total rents			75 0 0	125 0 0			124 18 0	125 0 0			124 18 0	140 2 0			219 16 0					

The price of wheat having been under 30s. per quarter for some five years previous to crop 1890, and the recent rise of about 10s. per quarter being chiefly caused by the shortness of most of the European crops of 1891, it should have followed that about 32s. per quarter would be high enough for a future basis, had that not been so very far under the former prices during this century. Although 36s. per quarter, the price I have adopted, is rather under present rates, yet with the possibilities of still increased foreign supplies in future years, it is perhaps high enough to be at all reliable; and if wheat should again reach and continue at nearly the rates current up to 1884, so much the better for both proprietors and tenants, though rents would then be somewhat raised, if on a produce system embracing wheat.

As to potatoes, still the most speculative of all crops, *and for that very reason I think one of the most popular*, such enormous returns have been obtained in some years by successful growers, and such poor ones in other cases, that the choosing of a proper rate is more difficult than even with wheat. Although 260s. per acre, which I have chosen, may be very far under the usual experiences of successful growers in good districts, yet 6 tons per acre of dressed potatoes at 40s. per ton, and 1 ton small and diseased at half price, will be found fully to exceed the averages published for recent years.

I do not propose that produce rents should in the meantime be adopted for hill-farms. The objection to doing so is chiefly the varied difficulties in assessing the annual produce or increment of mutton and wool per acre, or per 100 or 1000 acres; and to regulate rents merely by the prices per head of sheep or lambs, or per stone of wool, would be liable to very serious objections. In the first place, it would have the fundamental fault of not taking into account the quantity produced. But even if quantity and numbers could be annually estimated, the results combined with prices would but very imperfectly correspond with the owner's money returns *for the same year*. A very deficient crop of lambs—perhaps the worst casualty on a hill-farm—does not affect the farmer's pocket so much in the season it occurs as during the two following seasons—viz., the first year thereafter, when he is deficient of gimmers to breed from, and the second year, when short of two-year-old wedders for sale. It is, however, far from being beyond hope that the system might by-and-by be extended advantageously to mountain grazings for sheep and cattle. I must now state what appear to me the chief arguments both for and against a system of produce rents such as I have described.

Some approach to uniformity of income is more or less desirable for every one. It is, however, of greater importance for a man with a small than for one with a large income, inasmuch

as a deduction from his expected means may encroach on the necessities, or at least on the comforts of the former, whereas it will only reduce the luxuries or the savings of the latter. The fluctuation of rental caused by produce rents ought therefore to be less objectionable to proprietors—irrespective of their compensatory advantages—than are the fluctuations in their smaller incomes caused by fixed money rents to tenants. It may seem a paradox, at first mention, to speak of the fluctuations being caused in the landlord's income by produce rents and in the tenant's income by fixed rents. The solution of the seeming contradiction is, however, obvious enough. While the rent directly supplies the proprietor's income, it is the difference between the farm returns and the rent which forms the income of the tenant. Therefore, suppose the farm returns, after paying labour and other charges, should amount in one year to £400 and in the next to £500. By paying a produce rent in proportion to these returns—say, £200 for the first year and £250 the next—the balance to the tenant would only vary £50, whereas on a fixed money rent of £225, the difference betwixt his two years' incomes would be £100. Then on the landlord's side the compensations for any inconvenience from fluctuation of rental would be these: first, that if a produce rent was helpful to the tenant, it would enable him to make more permanent as well as temporary improvements on the farm; and second, that on a rent-roll made up of produce rents there would likely be fewer arrears than on one composed of fixed money rents, and claims for abatement would be more easily answered. So far as they operate, these two considerations, especially the latter, would also go to meet the difficulty which a proprietor paying heavy mortgage interest might feel in agreeing to a fluctuating rent.

There is another plea for produce rents, which, though it may be thought somewhat sentimental, has, I conceive, a practical bearing, at least if the keeping up of, and raising yet higher, the moral tone of the tenantry is a practical matter. Produce rents would tend to become, more strictly than rent is sometimes regarded, debts of honour as well as of contract. I think it may be safely claimed for British farmers that they have hitherto maintained a higher level of commercial morality in struggling against bankruptcy or compositions with creditors than has been held by the manufacturing, mercantile, or trading classes. In these laudable efforts, however, their relations with their landlords have been to some extent omitted. Nor could tenants be blamed for having less sympathy with their landlords than with their other creditors, so long as the rights of the former were protected by hypothec, and whilst rents were far out of proportion to tenants' profits.

It is evident that a rent based on quantities and prices com-

bined will fluctuate far less than if regulated by either singly. The former ought indeed, if several products be taken into account, to approach very closely in steadiness to a fixed rent. It may be asked then, from this point of view, Why should a complicated system supplant a simple one? There are two answers to this objection. The first is, that the preference of a fixed rent makes the offerer entirely dependent on correctly forecasting the profits of future years from those of the past—a forecast entailing wide risk of error, the effects of which may be avoided to some extent by produce rents. The second is, that although rents based on acreable produce values may not vary much betwixt one year and the next, *yet the difference in such rents betwixt the first and last years of a lease, if the variation, though slight, has been in the main in the same direction, may be very large.*

Other reasons in favour of produce rents nearly as cogent as the above might be adduced, whilst the only one I can think of having any semblance of relevancy against the system is this, that the establishing of the necessary facts might involve rather more disclosure of the results of their farming than some tenants would like. Such an objection could only be advanced by those who don't consider that only the facts already being published are requisite for both grain and stock, and that the collating of county prices with county quantities could reveal no secrets. As to potatoes, I have admitted that some further information as to price would be required; but, by the course I have proposed, that information would only pass secretly through one public official before merging into the general mass of county returns. Even if it were the case (and I don't see that it should) that some farmers might feel their privacy slightly encroached upon, ought not they to consider that occupancy as well as ownership of land has its duties as well as its rights?

Too much must not be expected from any system of produce rents. It makes no pretension to being a guide in the primary valuation of a farm, and it would be unfair, therefore, to object to it that the fixing of the extents of the crops for conversion and of the balance of money rent remain open questions for skill and debate. That is quite admitted. The only matter for which a produce rent system can be held at all answerable is *the maintenance of an originally estimated relation between the rent and the value of the county produce in face of the annual fluctuations to which the latter, and inferentially to somewhat the same extent each farm's produce, is subject.*

\* \* *Editorial Note.*—It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the writers whose papers are published in the 'Transactions.'—No. 1, General Regulations for Competitors.

## PASTURE-PLANTS.

By JOHN B. WEBSTER, Fair View, Dungannon, Ireland.

PRACTICAL experience and observation tell us that some species of plants are capable of accommodating themselves to a greater variety of soils and situations than others, although, at the same time, there seems to be a close and intimate law of connection between plants and the particular class of soil and situation in which they prefer to grow and attain their best and highest form of development. No doubt the hardy natural grasses form the backbone of the pasture-plants of Great Britain and Ireland; but there are several other species of plants that occasionally spring up among the grasses that are eaten and relished by sheep and cattle, the best of which we shall notice in the sequel. Botanists tell us that there are one hundred and sixteen species of true grasses to be found in the British Islands, but in this report we shall confine our remarks to such as are capable of being utilised as permanent pasture-plants, as well as those that are eaten and relished by sheep, deer, and cattle while growing in their natural habitats.

In the formation of sound pasture for sheep and cattle, the fescue tribe of grasses stands at the top of the list, as they are all thoroughly hardy, and form a large proportion of the herbage which clothes the surface of our best sheep-walks on both hill and dale in this country.

*Sheep's fescue* (*Festuca ovina*).—This is a small fine grass: it is both hardy and early, grows in tufts, the leaves of which are of a fine texture and much relished by sheep, deer, and cattle. I have sown the seeds of this grass along with others on bare spots here and there in a deer-forest at high elevations with perfect success. The quality of the mutton fed upon the Scottish, Irish, and Welsh hills, where this grass predominates, is considered to be superior in flavour and sweetness to that obtained from any other grass.

*Hard fescue* (*F. duriuscula*) is another hardy native grass, which thrives and reproduces itself with great freedom on a great variety of soils and situations. It is, however, best adapted for dry ground, as it sends its roots down, by which means it is enabled to resist the heat of summer, and retain its verdant green colour during winter, both of which qualities enhance its value very much as a pasture-plant.

*Meadow fescue* (*F. pratensis*).—This species is an excellent meadow-grass, hence its name. It prefers a deep rich soil, rather moist, but not wet. It is not adapted for dry thin land

on wind-swept hillsides; but in the valleys between hills, where the soil is of a rich quality, it gives a heavy crop, and is much relished by cattle.

*F. gigantea*, as its name denotes, is a tall species, which prefers the shelter of woods and hedges. It is, however, quite hardy, and affords a bite to animals during a storm, and is a good pasture and meadow grass.

*F. vivipara* inhabits rough rocky ground at high elevations, and is nibbled and eaten by deer and sheep.

*F. rubra* is a hardy species, which grows in tufts here and there on hilly ground in the vicinity of the sea-shore. It is not a valuable grass, but is occasionally eaten by sheep and cattle.

*F. calamaria* is principally to be found in the natural forests at high elevations, and is eaten by deer, sheep, and cattle.

*F. loliacea* thrives best on moist meadows: it gives a good return under favourable conditions, and grows where some of the finer grasses would perish.

*F. elatior* is another species that thrives best on damp ground rich in organic matter, and is a valuable pasture-plant on ground that cannot be thoroughly drained.

*F. sylvatica* grows in woods and plantations under the shade of trees, where many other plants would perish from want of air and light, and this appears to be its chief recommendation.

*F. pinnata* thrives best on dry, sharp, calcareous soil, and is both sweet and early, and relished by stock generally.

*F. bromoides*, *F. myurus*, and *F. uniglumis*.—These three are annual: they grow on all classes of soil and situations—such as roadsides, rubbish-heaps, old walls, and roofs of houses. Although they disappear in winter, yet they spring early in summer, and form a thick greensward, which is eaten and relished by cattle and sheep.

*Soft-grass* or *Yorkshire fog* (*Holcus lanatus*).—This is an inferior grass: it neither makes good hay nor rich pasture, yet on travelling through Scotland, England, and Ireland it is astonishing to see field after field almost clothed with this grass. The best recommendation is that it is very hardy, and capable of growing and reproducing itself on poor ground, where many of the finer grasses would die out. Its leaves are clothed with soft downy hairs, and all grasses of this kind are innutritious and of inferior quality. I have used it for the purpose of forming a sward on newly reclaimed peat-bog, which was unsuitable for the growth of the finer grasses; but I by no means recommend its use as a pasture-plant except under exceptional circumstances.

*Creeping soft-grass* (*Holcus mollis*), as its name denotes, has a creeping root, and when it appears on farms under a proper state of tillage it is looked upon by the intelligent cultivator as

a mere weed. It is, however, often found growing along with the former in meadows and pastures; but as it is also of inferior quality, it should be eradicated. I have found it useful for binding the surface of moss-roads, to form a sward and prepare them for harder material on the top.

*F. avenaceus* belongs to the same genus as the two former grasses, and is often found growing along with them, as well as on waste ground, hedgerows, and roadsides. It is eaten by cattle, but is not a nutritious thrifty plant for pasture.

*Perennial rye-grass (Lolium perenne)*.—This well-known grass is perhaps more extensively grown on ground under rotation of crops than any other species of British grass. It is hardy, fibrous-rooted, and capable of growing on a great variety of soils and situations; and although it is not a true permanent grass, yet it is found to be beneficial to mix its seeds with the more permanent grasses when laying down grounds for pasture, as it yields a good crop at the start and until such time as the more permanent grasses become established. There appear to be several varieties of perennial rye-grass, some of which are more permanent than others; but the best of them cannot be recommended for more than two years, as they, as a general rule, begin to die out, and to be replaced by other grasses. Strictly speaking, none of the varieties of this grass are really perennial, but, for the reasons already stated, it is advisable to use them as a mixture when laying down grounds for hay or permanent pasture.

*Italian rye-grass (Lolium italicum)* is a very valuable grass, which was introduced into this country from Italy in 1833 by Messrs Lawson of Edinburgh. It is sometimes mistaken for perennial rye-grass, and some botanists say it is merely a variety of that grass. Practical experience and observation, however, tell us that it grows more in tufts, and yields a far heavier crop in a given space of time than *L. perenne*. Italian rye-grass likewise starts earlier in spring, and continues to grow later in autumn than *L. perenne*, which features distinguish it from perennial rye-grass. As a general rule, it cannot be relied upon with safety for more than two years; but sometimes a quantity of seed is shed which produces fresh plants on the spot, and by which means the ground is occasionally well stocked with plants for a series of years. It prefers a deep moist soil rich in organic matter, and grows with great vigour in the genial moist climate of Ireland.

*Cocksfoot grass (Dactylis glomerata)*.—This is one of our best and most productive grasses: it grows on all classes of soils, providing they are not saturated with stagnant water. When well established, this grass presents the appearance of a round-headed tuft, well furnished with coarse leaves of a bluish-green



colour, which are nutritious and relished by stock of all kinds. It should enter into all mixtures for meadows, as it can accommodate itself to exposed situations as well as to sheltered places under the shade of trees. In such places it forms a good covert plant, as its broad pendent leaves afford shade and shelter for game. It takes its name from the appearance of its flower-stalks, which have some resemblance to that of a cock's foot.

*Timothy* or *meadow cat-tail-grass* (*Phleum pratense*) is a native of North America and Canada, and was introduced into this country in 1702 by a Mr Timothy Hanson, whose name it bears. It is said to be cultivated in some parts of America to a larger extent than any other grass. In this country it has become thoroughly naturalised, and has proved to be a great acquisition, and generally forms part of all mixtures of grass-seeds for laying down grounds for alternate husbandry or pasture. In a meadow laid down with a mixture of permanent grass-seeds fifteen years ago, I notice that timothy starts to grow early in spring, and maintains a rapid growth during the growing season: its stems present the appearance of fine clean shafts towering like giants above all its associates; but when we examine the plants closely, we find that they are not so well furnished with leaves at the base of the stem as some of the other grasses, and on traversing this field after the grass was cut for hay, it was evident that timothy produced a very light aftergrowth, which appears to me to be its only fault.

*Meadow foxtail-grass* (*Alopecurus pratensis*) is one of the earliest and best plants for meadows and permanent pastures. It produces long succulent leaves from the base of the stem, which are renewed very rapidly when eaten down by sheep and cattle: this enhances its value very much as a pasture-plant. It thrives on a great variety of soils, and answers well for irrigation.

*The alpine foxtail-grass* (*A. alpinus*) inhabits dry mountain ground in the Highlands of Scotland, and is eaten by sheep and deer.

*A. geniculatus* and *A. fulvus*.—These two species inhabit wet ground, ponds, and ditches, and are occasionally eaten by cattle while growing in their natural habitats.

*A. agrestis* is an annual species, which grows on waste grounds, fields, and roadsides, and although it is occasionally eaten by cattle, yet it is looked upon as a mere weed.

*Rough-stalked meadow-grass* (*Poa trivialis*) is a good thrifty grass, and is generally to be met with in all good meadows and permanent pastures. It prefers a deep moist soil rich in organic matter, and thrives very well in woodlands under the shade of trees. It has a fibrous root, or at any rate it is but slightly creeping, and when sown on light dry ground it is apt to get

burned up by the heat of summer; it, however, throws out shoots from the base of the stem, which root themselves on the surface of the ground during damp weather, and these become established in a short time, and as they keep green during winter, they afford a picking for stock during fresh genial weather in winter. This habit of growth fits it remarkably well for growing as a mixture with some of the more upright species of grasses, such as timothy, Italian rye-grass, &c.

*Smooth-stalked meadow-grass* (*P. pratensis*), as its name implies, is not only of a finer texture than the former species, but likewise of a less size. It has a creeping root, and is best adapted for dry light land on exposed situations. As a general rule, grasses with creeping roots thrive better on dry light ground than such species as are furnished with fibrous roots.

*Wood meadow-grass* (*P. nemoralis*) is a highly productive grass, capable of accommodating itself to a great variety of soils and situations, and is perfectly at home in open meadows as well as under the shade of trees in plantations, where it generally yields a good and profitable crop.

*P. compressa* thrives best on dry ground, and is a useful pasture-plant, when mixed with other grasses, for clothing the surface of poor dry ground.

*P. alpina*, *P. laxa*, and *P. glauca*.—These three species are mountain plants: I have generally found them in the deer-forest at high elevations, where they are eaten by sheep and deer.

*P. bulbosa* cannot be said to be a good pasture-grass. It inhabits dry sandy places at the sea-shore, and is occasionally eaten by cattle.

*P. annua* is an annual species: it starts to grow in early spring, and continues to grow in meadows and fields up to autumn; it, however, cannot be recommended as a thrifty pasture-plant.

*Crested dogstail* (*Cynosurus cristatus*) is a deep-rooting grass, which enables it to resist drought. It is a very hardy grass, and capable of growing on all classes of soils and situations. Pastures which contain this grass to a large extent should be kept well stocked to prevent it from throwing up hard wiry stems, which neither sheep nor cattle will eat: it, however, throws up a succession of juicy leaves from the base of the stem, which cattle and sheep eat with avidity. When these hard woody stems are allowed to grow, they are apt to irritate the eyes of sheep while feeding, and in order to counteract this state of things it is a good plan to run a mowing-machine over the surface to cut them down, which is also beneficial in promoting the growth of young leaves from the roots of the plants. Some people appear to be prejudiced against this grass; but it is by no means a bad pasture-plant when properly managed.

*Sweet-scented vernal-grass* (*Anthoxanthum odoratum*) is not a

very productive grass for pasture; but it makes excellent meadow-hay, and gives out an agreeable aroma when newly made into hay. It starts to grow in early spring, and continues to do so up to autumn. It answers very well for irrigation, and may be used with a mixture of other hardy grass-seeds in the formation of meadow-lands.

*Agrostis stolonifera* is a strong-growing productive grass with a creeping root, the stolons of which are capable of rooting themselves on the surface of the ground and producing independent plants from the parent. It is not adapted for calcareous soils of a dry, light, sandy texture. It thrives best on deep soil rich in organic matter, and that retains a considerable amount of moisture all the year round by means of capillary attraction. It gives a good return on reclaimed peat-bog, where some of the finer grasses would die out. It is one of our best grasses for irrigated meadows, especially those of a peaty or moory character. On reclaimed salt-marsh ground it also produces a heavy crop, and should always be introduced with a mixture of other grass-seeds for such situations. On suitable soil it thrives very well in woodlands, and makes good covert, and can be propagated in such places from seed, or by chopping up the stolons and planting them where they are to remain.

*A. vulgaris* is a good meadow and pasture plant, and is relished by all kinds of stock.

*A. alba* inhabits fields and damp marsh-ground, and is occasionally eaten by cattle.

*A. setacea* grows in tufts here and there on dry heather-ground, but is not a valuable plant.

*A. canina* grows and reproduces itself on moist ground that cannot be thoroughly drained, but is not a valuable grass.

*Sweet-grass* (*Glyceria fluitans*, *G. aquatica*, *G. distans*, and *G. maritima*).—These four species grow naturally in wet muddy pools and sides of ditches that cannot be properly drained: they are of too soft a texture for hay, but as they start to grow in early summer, cattle eat them with avidity. They also grow in wet places under the shade of trees, and are useful in irrigated meadows.

*Upright lime-grass* (*Elymus arenarius*) has a creeping matted root which I have found useful for binding loose sand and soft material, to prevent their removal by water during a spate; but it is of no value as a pasture-plant.

*E. geniculatus* inhabits wet marsh-ground, but is of no value as a pasture-plant.

*E. europæus* grows in a variety of soils and situations, and is useful as a covert-plant among trees; but it is of no great value as a pasture-plant, although it is occasionally eaten to a limited extent by cattle.

*Hair-grass* (*Aira caespitosa*) is one of the hardiest grasses we possess. Its appearance is that of a large conical tuft, well furnished with coarse, pendent, evergreen leaves of a dark-green colour, which are relished by sheep and cattle during winter when pasture-fields are bare. It thrives best on a damp soil resting upon a clay subsoil; and when thoroughly established, it is proof against the attacks of frost in winter and the drought of summer, a character of no mean order as regards a permanent pasture-plant.

*A. cristata* inhabits dry ground and pastures, and like the former species is both hardy and nutritious, and relished by stock generally.

*A. aquatica*, as its name implies, inhabits wet places: it starts to grow in early spring, on which account it is the more valuable.

*A. alpinum* is likewise an early species, that is commonly to be found growing in tufts on the mountains in the vicinity of the sea-shore. It is relished by sheep and cattle.

*A. flexuosa* is another hardy mountain-grass whose home is among rocks at high elevations, and although not a grass of great importance as a pasture-plant, yet it affords a welcome bite to deer and sheep in such places.

There are several other species, some of which are annuals, which belong to this genus, but their merits are not of any importance for feeding purposes, and on which account we pass them by.

*Mat-grass* (*Nardus stricta*) thrives best on dry hilly ground, where it reproduces itself with great freedom. It commences to grow in early spring, and in open genial weather it often continues to grow on throughout the winter, and thus affords a welcome picking for both sheep and deer. It, however, throws up a hard stem of a woody texture, which is innutritious and not relished by stock of any kind—and perhaps it is just as well, as some people are of opinion that the grain occasionally produces a spur or ergot which promotes the formation of the disease in sheep called “trembling.” The cheapest and best remedy for this is to keep the ground well stocked with sheep, to prevent the plants from flowering.

*Moor-grass* (*Sesleria caerulea*) thrives best on moist calcareous soils: it is a sweet early grass, and is both useful and nutritious.

*Heath-grass* (*Triodia decumbens*) inhabits spongy bogs and heather-ground, and although of no great importance as a pasture-plant, yet it fills up a gap where some of the finer grasses refuse to grow. It is occasionally eaten by cattle and sheep.

*Quaking-grass* (*Briza media*) is a sweet early grass: it grows on a variety of soils, but appears to attain its fullest and best form of development on loose friable soil of a calcareous nature.

I have found it, as well as *B. minor*, an annual species, growing on thin soil resting upon limestone rock, at an elevation of upwards of 1000 feet above sea-level.

*Sea-reed* (*Ammophila arundinacea*) is of no value as a pasture-plant; but it has a deep, spreading, matted root which is useful for binding loose sands, and therefore deserves to be noticed as a useful plant. I have used it with perfect success for binding loose material along the banks and margins of mountain streams in the Highlands and elsewhere.

*Scurvy-grass* (*Cochlearia armoracia*) inhabits wet ground, pools, and ditches, and although occasionally eaten by cattle, yet it cannot be recommended as a useful pasture-plant.

There are several annual species of this genus, but none of them are possessed of any particular merits, and are generally looked upon as troublesome weeds.

*Arrow-grass* (*Triglochin palustre*) is another plant that grows naturally in ditches, pools, and wet places. It is thoroughly hardy, and reproduces itself with great freedom. There is another species of this grass (*T. maritimum*) which inhabits muddy pools and wet places at the sea-shore; and although they are sometimes eaten by cattle, they are of no merit in particular for pasture.

*Bistort—knot-grass* (*Polygonum viviparum*) inhabits mountain meadows and pastures, and seems to be relished by deer, cattle, and sheep. There is another species (*P. bistorta*) to be found in some meadows and pastures, which affords variety, and is likewise eaten by stock generally. The other species which belong to this genus are not of sufficient importance to be noticed in this report.

*Oat-grass* (*Avena pratensis*) appears to thrive best on calcareous soils, at any rate the best grass of this species which I have ever seen was growing on a chalky soil in the south of England. It has a fibrous root which sinks deep into the subsoil, which in a great measure enables it to resist the drought of summer. It thrives very well under the shade of trees, and although it attains a good average height in such places, it is generally deficient in side leaves to form good covert. When cut early, before it matures its seed, it makes good hay, but has nothing in particular to recommend it as a pasture-plant.

*A. flavescens* is likewise a hardy species, which inhabits dry meadows, pastures, waste ground, and roadsides. I have found this species to be pretty common in some of the congested districts of Ireland; but it is not a thrifty productive grass, further than that it reproduces itself on the spot with great freedom.

*A. alpina* is a hardy species, which principally inhabits the

Scottish hills at high elevations. It grows in tufts, and is occasionally eaten by sheep and deer.

*A. pubescens* is capable of accommodating itself to a great variety of soils, providing they are not saturated with stagnant water.

*A. fatua* and *A. strigosa* are both annual species that shoot up hard, dry, wiry stems, but are of no value for utility as pasture-plants.

*Rib-grass* (*Plantago lanceolata*) is a useful hardy plant, which grows and reproduces itself on a great variety of soils and situations, and appears to be quite at home in the congested districts of Ireland and elsewhere, where the ground has been neglected for want of draining and proper cultural care. I have also found *P. major* and *P. media* growing along with the former species in similar situations, and they appear to be relished by stock generally, but are not adapted for hay. They have all fibrous roots which sink deep into the subsoil, and thus are enabled to resist the drought of summer. There are other two native species which belong to this genus; but as they are mere weeds, and of no value as pasture-plants, we need not describe them here. All the species should be kept closely eaten down, to prevent them throwing up a hard stem, which is not relished by cattle.

The clovers comprise several distinct species, which are widely different in their habits and requirements; but the kinds which I have found to be best for thrift and utility are red clover, white clover, and yellow clover.

*Red clover* may be divided into two classes—namely, biennial red clover (*Trifolium pratense bienna*) and the perennial red clover or cow-grass (*Trifolium medium perenne*)—but as the appearance of both plants is so much alike, there is sometimes considerable difficulty in distinguishing the one from the other. Both plants, however, possess woody fibrous roots, which enable them to penetrate the hard subsoil to a considerable depth, and resist the drought of summer and frost of winter unscathed. The roots, however, of the biennial species are rather thicker at the base of the stem, and the leaves more of a smooth glossy appearance than those of the perennial species. Practical experience and observation, however, tell us that neither of the two species are really permanent, as both die out in a few years. Experience also tells us that when red clover is grown for a series of years in the same place, the ground gradually becomes what is called “clover-sick.” I should, however, state that when the ground becomes sick of the biennial red clover, the cow-grass, or perennial species, may be grown for a longer period of time than the former without causing clover-sickness in the soil.

*White clover*, or *Dutch clover* (*Trifolium repens*), is a well-known thrifty perennial plant, with a strong fibrous root and creeping stem. It thrives best on a calcareous or marly soil: the former should contain not less than 20 per cent of carbonate of lime; but when it is between 5 and 20 per cent, the soil is said to be marly. Although it thrives best on this class of soil, yet it is by no means confined to such, as we find it growing and reproducing itself on a great variety of soils. When pasture-grounds that are deficient in lime receive a top-dressing of lime, or lime and earth mixed, the white clover springs up naturally. I have found the end of harvest the best time to apply this top-dressing. The white clover is a sweet, nutritious, and wholesome food, and is much relished by sheep and cattle, and should therefore be used as a mixture of grasses in the formation of permanent pastures; but it is not so valuable for hay or forage purposes.

*Yellow clover*, or *common trefoil* (*Medicago lupulina*), is a useful hardy plant, and is grown principally on dry inferior soils resting upon chalk and limestone. Its principal recommendation is that it grows with certainty on dry thin soil, inimical to the growth of many other plants. As a forage-plant it is inferior to any of the kinds of red clover.

*Alsike clover* (*Trifolium hybridum*) was introduced into this country from Sweden, and as it is found to grow on ground that is sick of red clover, its merits on that account are of considerable importance. It has proved to be quite hardy, and capable of accommodating itself to a great variety of soils and situations. It makes good pasture, but as a forage-plant it is inferior to red clover.

*Trifolium ochroleucum* is a hardy species which inhabits dry pastures. It is perennial, and dips its roots deep into the subsoil, which enables it to resist the drought of summer with impunity.

*T. pratense* grows naturally in meadows and pastures, and is relished by sheep and cattle. It is a perennial, and thrives on a variety of soils.

*T. medium* is best adapted for calcareous soils of a dry friable texture. It sends its strong woody roots down into the subsoil and fissures of rocks, which enables it in a great measure to resist the drought of summer. It is relished by sheep.

*T. fragiferum* is a hardy species, which grows and reproduces itself on moist meadows and pastures. It is eaten by stock with avidity.

There are several other species which belong to this genus, but as they are all annual and not permanent, they are of no great importance as pasture-plants.

*Bird's-foot trefoil* (*Lotus corniculatus*) inhabits pastures, dry banks, and gravelly soil, and is much relished by sheep and cattle.

*L. major* is a useful hardy plant: it grows naturally in damp bushy places and in woods, and is relished by stock generally.

*L. decumbens* is to be found growing naturally in fields and meadows, and is a useful, hardy pasture-plant.

We shall now take the useful leguminous or pea-blooming plants, all of which as a general rule are nutritious and relished by stock.

*Pea* (*Pisum maritimum*) inhabits damp ground and other places in the vicinity of the sea-shore. It is perennial, and is occasionally eaten by cattle.

*Kidney-vetch* (*Anthyllis vulneraria*) inhabits dry, chalky, and marly soils, but is by no means confined to such, as I have found it on different classes of soils and situations. It is relished by cattle, either made into hay or as a pasture-plant, and is very valuable.

*Bitter-vetch* (*Orobis tuberosus*).—This is a very hardy tuberous-rooted species. I have found it growing among the heather in the vicinity of Lochnagar, where it is relished by deer and sheep.

*O. niger* grows on dry hilly pastures in the Highlands of Scotland, and is apparently relished by deer, sheep, and cattle.

*O. sylvaticus* is rather a rare plant, but is occasionally to be found growing on different kinds of soil in the natural forests and elsewhere. It is eaten by deer and sheep.

*Vetchling* (*Lathyrus pratensis*) inhabits meadows and pastures, and is eaten by stock, either made into hay or as pasture. It grows on a great variety of soils, providing they are not saturated with water.

*L. sylvestris* inhabits moist ground, thickets, and hedges, and is relished by stock generally.

*L. latifolius* inhabits dry ground in woods and plantations: it is by no means a common plant, and is of no great value for hay or pasture, although cattle occasionally eat it.

*L. palustris* grows naturally in moist meadows, pastures, hedges, and thickets, and appears to be relished by stock generally.

The other native species which belong to this genus are annuals, and consequently of no great value as pasture-plants.

*Vetch* (*Vicia sylvatica*) grows naturally in a great variety of soils and situations, and is at home in woods and plantations at high elevations above sea-level. It is eaten and relished by all kinds of stock.



*V. cracca* inhabits hilly pastures, hedges, and bushy places. It is eaten by cattle and sheep.

*V. lutea* is principally to be found in the vicinity of the sea-shore, and although it is occasionally eaten by stock, it is of no great value as a pasture-plant.

*V. hybrida* is rather a rare species, which inhabits dry ground in hedgerows and bushy places. It is relished by stock of all kinds.

*V. lævigata* inhabits stony rocky ground near the seaside, and is occasionally eaten by sheep and cattle. It is by no means a common plant.

*V. sepium* is generally to be found growing in thickets and hedges, where it reproduces itself with freedom. It is relished by stock generally.

*V. bithynica* inhabits dry gravelly ground, and seems at home under the shade of trees and scrub. It is only to be found in dry situations, and is eaten by sheep and cattle.

The other species which belong to this genus are annuals, and of no importance as permanent pasture.

*Horse-shoe-vetch* (*Hippocrepis comosa*) thrives best on dry calcareous soils, and is both sweet and early, and eaten by sheep and cattle.

*Milk-vetch* (*Astragalus glycyphyllos*) thrives best on dry calcareous soils of a light texture. It seems at home among surface scrub in plantations, and is eaten by stock generally.

*A. hypoglottis* inhabits dry sandy soil resting upon the chalk or limestone formation. It is useful as a pasture-plant in such situations.

*A. uralensis* inhabits dry mountain-ground in the Highlands of Scotland, and is relished by deer, sheep, and cattle.

*A. campestris* inhabits bare rocky places in the Highlands of Scotland, and is occasionally eaten by deer and the white mountain-hare.

*Milkwort* (*Polygala vulgaris*) grows in dry gravelly places, and is quite at home in bushy thickets and hedges. It is occasionally eaten by cattle.

*Medick* (*Medicago sativa*) inhabits meadows, pastures, and other places where the soil is dry. Although cattle eat it, yet it has nothing in particular to recommend it as a pasture-plant.

The other species which belong to this genus are of no importance as pasture-plants.

*Daisy* (*Bellis perennis*) inhabits meadows and pastures on all classes of soil, and keeps in a green growing condition for nine months of the year. It is eaten with apparent relish by all kinds of stock.

*Tansy* (*Tanacetum vulgare*) is a well-known weed which infests fields and pastures. It comes into flower in early autumn, and

in that stage of its growth no animal will eat it. In early spring, however, sheep relish its small, tender, parsley-looking leaves; and the best way to keep it in subjection is to winter sheep on the ground infested by it. These remarks may likewise be applied to thistles, as they are all more or less nutritious in the early stages of their growth in spring, and are often eaten by sheep at that season with great gusto. It is not to be understood that I recommend the culture of these plants, further than to say that in hard late springs I have found them valuable on hill-pasture, as they afford a welcome picking to sheep at that particular season of the year; and it is only their sharp protective spines that prevent animals eating them at a further advanced stage of their growth. The common whin, *Ulex europæus* and *U. nanus*, may be referred to the same category as the thistles. Both are wholesome nutritious food for horses when properly prepared, and it is their sharp spines that prevent animals browsing upon their twigs and shoots to a larger extent than they do. In hilly parts of the country the common whin might be utilised to a far greater extent than at present. It is not only nutritious food for horses, but likewise makes good covert and fences when properly managed. It thrives best on loose stony ground free of stagnant water; but its hardiness cannot be depended upon at a higher elevation than about 800 feet above sea-level. Among other weeds that are occasionally eaten by animals we may place *black knapweed* (*Centaurea nigra*) and *devil's bit* (*Scabiosa succissa*): they are both troublesome weeds on pasture-fields and elsewhere, and although cattle refuse to eat them, yet sheep eat them with avidity in the early stages of their growth, and before they shoot up their hard woody stems. *Meadow-sweet* (*Spiræa filipendula*) is often looked upon as a mere weed; it grows best on dry hilly pastures, and is relished by cattle and sheep. *S. ulmaria* is another species that inhabits damp meadows; it makes good meadow-hay when mixed with any of the hardy grasses, but requires to be cut when it is bursting into flower, otherwise the stems become too hard and woody. It grows and keeps its position in meadows that are liable to be flooded every winter, and where many of the grass tribe of plants perish. Both species make excellent pasture for cattle, sheep, and horses. In the Lough Neagh district of Ireland, I have seen a meadow that contained a good mixture of this plant let by auction at £7 per acre.

*Yarrow* (*Achillea millefolium*) is a hardy perennial plant that inhabits dry ground, meadows, and pastures. In August and September it produces a hard woody stem that is seldom eaten by stock of any kind; but in spring, and during summer, its fine succulent leaves are looked after and relished by sheep, cattle, and horses.

*A. tomentosa* inhabits dry hilly ground in the Highlands of Scotland, and is eaten by deer and sheep.

*Silver-weed* (*Potentilla anserina*).—This pretty little plant inhabits a great variety of soils and situations, as it appears to be quite at home on turf, peat-bogs, stiff adhesive clay, and dry gravelly soil. It is of no use as hay, but is a good pasture-plant.

*P. verna* is an early little perennial plant, to be found on dry pastures and other places at high elevations: it is much relished by sheep.

*P. opaca* inhabits dry ground, principally in the Highlands of Scotland, and is eaten by sheep, deer, and the white mountain-hare.

*Creeping cinquefoil* (*Potentilla reptans*) inhabits dry pastures, meadows, dry banks, hedges, and woodland thickets. It is eaten by sheep and other animals, and hay that contains a mixture of this plant is much relished by all kinds of stock.

*P. tridentata* inhabits hilly ground in the Highlands of Scotland, and is relished by sheep.

*P. fragariastrum* thrives best on dry ground, and makes excellent sheep-pasture when mixed with some of the hardy grasses.

*Cotton-grass* (*Eriophorum vaginatum*) is a useful plant that grows best on peat-bog that retains excess of moisture by capillary attraction. In the sheltered glens, corries, and boggy tarns of the Highland hills it affords an early bite to both sheep and deer before the grasses and other hill-plants commence to grow in, spring, on which account it is the more valuable as a pasture-plant. It is a perennial, and reproduces itself on the spot with great freedom.

There are several other species which belong to this genus; but as they are all much inferior to the former as pasture-plants, it would be useless to occupy space giving details.

*Rush* (*Juncus squarrosus*) is another useful plant that inhabits peat-bog ground, and is much relished by sheep in spring and early summer before the grasses have made much headway of growth. It is perennial, and grows in tufts.

*J. bufonius* is an annual species that I have found pretty common on reclaimed Irish peat-bog. It is much relished by sheep.

*J. trifidus* is a hardy perennial species that I have found on the Braemar hills at an elevation of nearly 3000 feet above sea-level. It is occasionally eaten by deer and sheep.

*J. articulatus*, or *common spirit*, is a useful perennial plant, but only semi-evergreen, although I have known it in Ireland to remain green all the year round. It thrives best on a damp mossy soil mixed with alluvial deposit, in the vicinity of water.

Good sprit-land is very valuable to the hill-farmer, as it affords an early bite to sheep and cattle. Red-deer and fallow-deer likewise relish it in early spring when the hill-pastures are bare. When cut and well saved during summer, it makes excellent hay for cattle and horses.

*Asphodel* (*Narthecium ossifragum*) is another plant that grows on damp peat-bogs, and is much relished by sheep. It is a perennial, but is not an early spring plant, and consequently is of less value.

*Club-rush* (*Scirpus cespitosus*) inhabits damp mossy ground, and is much relished by sheep in spring and early summer.

There are several other species which belong to this genus, none of which are of any value as pasture-plants.

*Lady's smock* (*Cardamine amara*) grows naturally in wet bogs and stagnant ditches. It is a perennial, and is relished by sheep and cattle during the early stages of its growth in spring. In early summer it produces a flower-stem some 20 inches high, crowned with beautiful pink flowers, which are seldom eaten.

*C. pratensis* is another perennial species that belongs to the same genus. It inhabits pastures and meadows, and is relished by stock generally in early spring.

The other species which belong to this genus are of no importance as pasture-plants.

*Sedge* (*Carex panicea*) grows on moist pastures and damp boggy land, and affords an early bite for sheep during winter and spring.

*C. cespitosa* is another species that grows on wet mossy ground, and is relished by sheep during winter and spring, when the up-land pastures are bare. Both species are perennial, and reproduce themselves. There are a considerable number of other species which belong to this tribe of plants, and although some of them are interesting and make good covert, yet their merits are not of sufficient importance to be recommended as pasture-plants.

*Common heather* (*Erica vulgaris*), when properly managed, is one of our best pasture-plants. It thrives best on peat-bog and mountains, where the surface consists of a light soil of a mossy texture. It requires to be burnt by rotation to keep it in proper condition as pasture for sheep, deer, cattle, and game. There are several other species of native heather; but as they are all much inferior to the common species for pasture, we shall not describe them here. From the open nature of heather, snow falls down among its stems, branches, and twigs, without pressing it flat on the ground, by which means cattle are enabled to browse upon its tops during a fall of snow, and when other pasture-lands are covered. Sheep relish heather all the year round,

but more especially in winter and spring, when other pastures are bare.

The blaeberry (*Vaccinium myrtillus*) is another hardy mountain plant that stands up well during a snowstorm, and affords a welcome bite to sheep during stormy weather in winter and spring. It is a perennial, but on very exposed situations is but semi-evergreen; but in mild weather and sheltered situations it retains its foliage all the year round.

*V. Vitis-Idæa* inhabits hard stony ground: it is perennial and evergreen, and in the Braemar Highlands I have occasionally found it eaten by sheep and deer during a spell of stormy weather.

Cranberry (*Empetrum nigrum*) is another hardy evergreen plant that inhabits dry rocky hills; in stormy weather I have occasionally found it eaten by deer and sheep. In the Braemar Highlands I have found this plant at an elevation of some 3000 feet above sea-level, where its terminal buds are eaten by ptarmigan and grouse, in the same way that they eat heather.

Thyme (*Thymus serpyllum*) is a hardy perennial species which grows on dry heather-ground in the Highlands, and is much relished by sheep and deer.

*T. calamintha* is likewise a hardy Highland species, that grows best on dry gravelly ground, banks, and mounds of a loose open texture. Mutton produced upon ground well stocked with thyme retains the taste of the plant.

Lady's mantle (*Alchemilla alpina*) inhabits dry ground at high elevations, and is occasionally eaten by sheep and deer.

*A. vulgaris* is a larger size than the former, and thrives best on dry pastures and natural meadows. It is eaten by cattle when made into hay, and is also relished in a green growing condition at the early stages of its growth.

Crawfoot (*Ranunculus gramineus*) inhabits dry alpine pastures. It is a useful evergreen plant, and relished by sheep, deer, and cattle.

*R. ficaria* grows in meadows and pastures, and is relished by cattle and sheep.

*R. bulbosus* thrives best on light boggy soil, and is a thrifty pasture-plant.

*R. repens* inhabits meadows and sandy ground of a light texture. It is an excellent pasture-plant.

*R. acris* grows on any ordinary class of soil, and is a good pasture-plant.

Although these are good pasture-plants, yet they are of little or no importance for the making of hay. They are all well adapted for ground that is liable to be flooded during winter, as they are all very tenacious of life. There are several other

species of this genus; but as they are merely troublesome weeds, we shall not describe them here.

*Couch-grass* (*Triticum repens*) inhabits waste uncultivated ground and other places, and is a well-known pest to farmers and others. It is very hardy, which is the only recommendation it possesses, as it makes inferior hay and pasture.

There are several other species of couch-grass, none of which are of any importance for pasture and utility, as they are mere weeds.

*Sheep's parsley* (*Petroselinum sativum*) is a biennial plant, or perennial if kept closely eaten down by sheep and not allowed to flower. It is indigenous to Sardinia, and is said to have been introduced into this country about the year 1548. In some localities this valuable plant has become naturalised, and is much relished by sheep and all herbivorous animals; and as it is a preventive of liver-rot in sheep, it should be introduced into all permanent sheep-pastures if possible. It thrives on a great variety of soils, providing they are dry, or rendered so by efficient draining. When laying down permanent sheep-pasture, I have mixed 1 lb. of the seeds of sheep's parsley with the grass and clover seeds required to sow each imperial acre. In hill-pastures this plant might be introduced by merely breaking the surface of the ground here and there, and dropping a few seeds at the spot in the month of April.

*Carrot* (*Daucus carota*) is a biennial plant indigenous to Great Britain and Ireland. It inhabits dry banks and permanent pasture-grounds. It has a deep tap-root which sinks into the subsoil, by which means it is enabled to resist summer drought with impunity. Its tender parsley-looking leaves are greedily eaten by sheep; and when the plant is brought under a state of culture, its root is nutritious for both man and beast.

*Earth-nut* (*Bunium flexuosum*) is a hardy perennial that inhabits dry banks among trees and elsewhere. It starts to grow in early spring, and affords a welcome bite for sheep at that season. If the plants are allowed to produce hard woody stems, these are not eaten by sheep.

*Ivy* (*Hedera helix*) is a well-known climbing plant that inhabits dry banks, trees, and walls. During winter and spring it is eaten by sheep and deer, and appears to act as a stimulant and tonic; at all events they thrive remarkably well when allowed occasionally to feed upon ivy twigs and leaves.

*Cranebill* (*Geranium pyrenaicum*) inhabits meadows and dry pastures, and is relished by sheep and cattle.

*G. pratense* inhabits mountain pastures at high elevations, and is eaten by sheep and deer.

*St John's-wort* (*Hypericum montanum*) grows on dry rocky hills, and is relished by deer and sheep.

*H. perforatum*.—The leaves of this interesting species appear as if perforated here and there with a needle. It attains its best form of development on the limestone formation at high elevations, and is eaten by deer and sheep.

*H. clodes* inhabits mountain bogs and other places, and is occasionally depastured by sheep.

There are several other species which belong to this genus, none of which are poisonous, and are occasionally eaten by stock.

*Aspen poplar* (*P. tremula*).—This tree produces young suckers from the surface roots as well as young plants from seed, both of which are depastured by sheep, deer, and cattle. In the Highlands I have cut this young growth and converted it into hay along with different species of grasses, and when well saved it is eaten by cattle and hill-ponies during winter.

#### GENERAL REMARKS.

The substance of this report has been gathered over a wide range of country in Scotland, England, Ireland, and Wales, and contains the results of many years' observation in the low country as well as in the Highlands and Islands. In giving a detailed list of pasture-plants that are eaten by cattle and sheep, I find that these animals vary in their tastes to a considerable extent in different parts of the country. This arises in a great measure from the particular species of plants that have been most common in the locality where the animals were brought up in early life, as they still seem to relish the kinds of plants which they have been accustomed to eat when young. Beasts brought up on natural hill-pasture show their likings in this respect in a very pronounced manner. As, for example, a Shetland cow or a Shetland pony can make a meal of seaweeds and marine plants, while the same species of animals brought up in inland districts of the country would perish on such fare. Again, the hardy little Kerry cows of Ireland, that are brought up on the bleak mountains of that country, eat weeds and surface scrub that would be rejected by the same breed of cattle in the fertile places of that or any other country. Another point of importance in connection with this subject is, that the kind of food which animals eat has a great influence on the quality, firmness, taste, and flavour of the meat produced. The influence of food on the flesh of animals is not confined to cattle and sheep, as it likewise extends to wild animals, such as deer, hares, rabbits, and game. We shall give a short example. In part of a plantation of trees, where wild garlic (*Allium ursinum*) clothed the surface of the ground to a considerable extent, all the rabbits in this quarter of the wood had the strong taste

and flavour of that plant. Other similar examples might be given, but it would be superfluous. Practical experience and observation tell us that the *fescue* tribe of grasses takes the highest order of merit as permanent pasture-plants. Fine examples of this may be seen on the Scottish, Welsh, and Irish hills, where the sheep's fescue grass is abundant, and gives the best results for feeding purposes, and the quality of the mutton produced, independent of the breed of sheep, is very superior. Sheep-pasture in many cases might be greatly improved by sowing the seeds of these hardy nutritious grasses on bare rocky ground in the month of April. After the seeds are sown, drag a collection of tree branches or whins over the surface, to cover and mix the seed with the soil. I have found the best results by using whins for this purpose, as the sharp spines break up and pulverise the surface in an even and uniform manner as a bed for the seed. On the other hand, wet hill-pasture may be improved by opening surface drains in autumn or during winter. The stuff excavated from the drains should be spread out in a uniform manner on the surface, to form a bed for grass seeds to be sown in spring. All these seeds should be sown broadcast, and covered as per above directions.

The next point of importance in the management of hill-pasture is to provide shelter on cold wind-swept districts of the country. This is best attained by planting Scotch fir and larch trees in belts or groups here and there, to break the force of the wind and ameliorate the climate. I have used both kinds of trees for this purpose, both in the deer-forest and sheep-walks; and on very exposed ground at high elevations the evergreen Scotch fir planted in groups is the best. On less exposed situations, however, I prefer the larch, as it sheds its leaves every autumn, which fall to the ground as regular and even as a shower of snow; and as these are fixed to the spot and not apt to be blown away by wind, they soon rot and form a rich deposit on the surface, which promotes the growth of natural grasses close to the stems of the trees, by which means shelter is provided and the pasture improved at the same time. When groups of trees are planted here and there on hill-pasture, their influence for shelter can be felt at a distance of a couple of miles from the base of the plantation. My experience is that good shelter stands next in importance to a full allowance of nutritious food for the full and healthy development of all kinds of animals.

In laying down grounds for permanent pasture, the proper preparation of the land is a matter of vital importance. In the first place, the ground should be thoroughly drained, and the surface well broken up and pulverised to form a fine tilth for the seed-bed. All surface and noxious perennial weeds should



be carefully removed, as it would be bad economy to sow good seeds on rough uncleaned land. When these conditions are attained, great care should be exercised in selecting the seeds most suitable for the soil and situation. A table of seeds might be given, but as these tables are often misleading, and do not suit all soils and situations alike, the cultivator should exercise his judgment on the spot and act accordingly. As a general rule, grass seeds should not be sown earlier than the beginning of April, nor later than the end of August, otherwise the young plants are liable to be damaged by frost. Choose a fine calm day for sowing the seeds, and have them harrowed in at once with a light "chain or bush" harrow, as already described. The ground should then be properly rolled, in order to render the surface smooth and firm, and thus accelerate the growth of the seed. Stiff adhesive clay soil and peat-bog can be much improved by a heavy dressing of lime. Lime increases the produce and quality of all kinds of crops with the exception of flax; but perhaps there is no tribe of plants that derive more benefit from its application than the grasses. By applying lime to cold inert soil, the dormant particles which it may contain are roused up to an active fertile state as plant-food; white clover generally springs up of its own accord; it improves red clover and all kinds of grasses in quantity and quality; it assists to eradicate moss from old exhausted pastures, and strengthens, thickens, and sweetens the pasture-plants generally. On the other hand, dry sandy soil of a light texture can be best improved by applying the lime made into a compost of earth or peat, and although its action in this state may be slower than in the former case, yet I have found it to be more lasting and beneficial. The quantity of lime applied per acre varies considerably according to the nature of the soil. Upwards of 10 tons per acre may be applied with advantage to newly reclaimed clay and bog land, and as it has a tendency to sink in the ground, it should always be applied on the surface and covered as lightly as possible with a light or bush harrow.

---

#### GENERAL SHOW OF THE HIGHLAND AND AGRICULTURAL SOCIETY, HELD AT STIRLING IN 1891.

THE Sixty-fourth Show of the Society took place at Stirling on the 28th, 29th, 30th, and 31st July 1891. The Society had met at Stirling on four previous occasions—namely, in 1833, 1864, 1873, and 1881.

The General Meeting of Members was held in the Pavilion

in the Showyard at 11.45 A.M. on Wednesday, 29th July, and the public Banquet took place the same evening. The Duke of Montrose, President of the Society, occupied the chair on both occasions.

The following remarks regarding the stock are taken from the notes by the judges:—

#### CATTLE.

*Shorthorn*.—Notwithstanding the absence in every section, through disease restrictions, of famous showyard animals, the display of shorthorns was indeed creditable, and certainly superior, as a whole, to any that has been seen at the Society's meetings for some years. Eleven animals appeared in a class of fourteen entries in section 1, bulls calved before 1st January 1889. This class was a very good one, and contained many really good animals. The one placed first won easily, and was afterwards awarded the Tweeddale gold medal as the best bull of the breed. This animal showed very good quality, with a fair amount of flesh and substance. The second- and third-prize animals were well deserving the prizes, while they were closely followed by the three commended animals, all very useful bulls. Seven bulls appeared in section 2, a useful lot. The one placed first, although a little coarse in his quarters and tail, is otherwise good; the second was a very thick-fleshed bull, and was preferred to the third, an animal of great style, but rather high standing. Those placed fourth and fifth were of considerable merit. Again seven bulls appeared in section 3. They were perhaps the weakest as to individual merit in bull sections. The first was a strong useful bull, shown in good bloom. The second and third followed closely. Six very good cows formed section 4. The first was exceptionally good, and, as a three-year-old, perhaps one of the best seen for years. The second was a beautiful young cow, with much quality. The third, also a three-year-old, followed closely. Six two-year-old heifers formed section 5. The winner of the first prize was a beautiful animal, while the second, although of rather a different type, was also very good. Seven animals made up the number shown in section 6. Taken as a whole, they were not a very high-class lot. The first was a straight, level, and pretty heifer; the second was well grown; while the third was younger and smaller, but promising.

*Ayrshire*.—The first prize in the section for bulls calved before 1st January 1889 was an easy winner and of exceptional quality. The others were only ordinary specimens of the breed. The first four in the section for two-year-old bulls were very equal in regard to points of merit, varying little except in size and condition. The same remarks apply to the section for one-year-old bulls. Both classes, as a whole, would compare favour-

ably for general excellence with any that have been seen at any show this season. The section for cows in milk of any age contained five or six very superior specimens of the breed, especially the first three prize-winners: the same symmetry through the body, with well-balanced useful vessels, is seldom seen. The cows in calf of any age were a fair average class, with the exception of one animal. The two- and one-year-old heifers were all very superior animals, and the judges were unanimously of opinion that the show of Ayrshires this year had not been equalled for general excellence throughout since the Show was held at Dumfries in 1886, and especially for cows in milk, which had not been excelled even there.

*Aberdeen - Angus.*—Unfortunately the existence of pleuropneumonia in certain districts, and the disastrous consequences that might result from the presence of *in-contact* cattle, deterred some breeders from entering their stock, and caused others to withdraw them after being entered. Consequently the classes, with the exception of the yearlings, were not well filled. There were only four exhibits in the old bull class; they were a fair lot, but there was nothing with outstanding merit amongst them. The two-year-old bulls were a good class, and was topped by an exceptionally good animal—good enough, in fact, to easily win the special prize given for the best of all the bulls, an achievement that, so far as I know, has never been accomplished before by a two-year-old. The yearling bulls were a strong class, and contained several animals of great merit. In the aged cow class there was only four exhibits, but three of them were very high-class animals. The three-year-old cow class contained five exhibits, all of which were very good. The two-year-old heifers were also a very good lot. The yearling heifers were a very large class, numbering no fewer than twenty-three; so large was the class that the judging-ring was much too small to hold them. They were a very evenly balanced lot. I think that it is only fair to note that the Marquis of Huntly won first-prize honours in three of the female classes, and all with animals of his own breeding.

*Galloway.*—The Galloways exhibited possessed more than average merit, and the sections were generally well filled. A better class of aged bulls has been seen, but each of the three forward showed good qualities. The first-prize bull, to which was awarded the medal as best male, has excellent quality, but his hind quarters are not equal to his fore ones. The second-prize animal is level and good almost everywhere except at the tail-root, which is objectionable; while the third-prize one, though having great substance, is coarse in his bones. The two-year-old bull class was fairly good; the one placed first was massive, but has an indifferent head; the second

was a promising animal, but showed himself to disadvantage; while the third, though showing genuine Galloway character, seemed out of bloom. The turn-out of yearling bulls was a meritorious one: the one which was awarded first prize is symmetrical, though wiry in his hair; the second, which ran his successful rival very close, has an excellent coat of hair, and was very promising; and there were other good specimens of the breed in the class. The females in the Galloway sections were highly creditable, especially the cows and one-year-old heifers. Two large-framed massive cows were placed at the head of that class. The first cow, though seven years old, appeared in grand bloom; the merit of the second, though high, was detracted from by a hollowness behind the shoulders; the third, though comparatively undersized, was symmetrical and attractive. The two-year-old heifers were good, though better have been seen at Highland Society's Shows. The yearling heifer class contained the gems of the breed: this was specially true of the first-prize one, which was a beautiful and promising youngster. Several excellent heifers of great size and substance for their age were exhibited in this class, but they did not show the quality of those placed before them.

*Highland.*—Stirling being a convenient centre for exhibitors of this picturesque breed, the different sections were well filled, and the animals exhibited displayed a high standard of merit. Among the aged bulls were several excellent specimens of the breed. The first-prize animal in the two-year-olds was of outstanding merit, while the rest of the animals were well brought out. The class for yearlings was numerously represented, and the animals showed good style and breeding. The section for cows was ably represented by several meritorious animals, while among the three-year-old heifers were some magnificent specimens. The first-prize animal in the two-year-olds was of exceptional merit and quality, and was awarded the prize for the best female.

#### HORSES FOR AGRICULTURAL PURPOSES.

*Stallions and Entire Colts.*—There was a large entry of twenty-two aged stallions, most of whom were forward. The greater number of the horses showed signs of a heavy season's work, and were consequently not in the best of bloom: they were also pretty mixed as to style and quality, which made it somewhat difficult to place them satisfactorily. The two first showed a lot of quality, the next three on the list had more weight and massiveness, while on the whole they were a fairly useful class. Out of eighteen entries of three-year-old stallions there were a few absentees: this section furnished the champion

horse of the Show in Mr Peter Crawford's Prince of Carruchan, a horse of great massiveness and style, combined with extra good movement, which singled him out as a good winner; however, any one of the four horses following him would have made a good first on many an occasion. No fewer than twenty-eight two-year-old colts were entered, but one or two noted animals were absent: the prize-winners were mostly colts of extra quality, many of them former prize-takers, and, as a whole, this was probably the best class of males shown. The yearlings, while pretty numerous—twenty-three being entered—were not, as a lot, particularly good; the first- and second-prize winners stood well out, then came a number of colts of different types, exceedingly difficult to place, but most of those ticketed looked like growing into big heavy horses. Taken as a whole, the class of horses shown may be said to have been a fair average, though with fewer cracks than in some former years.

*Mares and Fillies.*—This was an exceptionally good display of the Clydesdale breed. There was a large entry of brood mares, and the general quality was above the average. Seven were decorated with awards, but it is no exaggeration to affirm that the eighth was as good a mare as has sometimes carried first honours in the same class. It was a hopeful sign of the breed to see so large a number of really excellent mares with foals at foot. Mares in foal were a much smaller class, and the average quality was not equal to that of the brood-mares. The leading animals, however, were excellent, breeding-like females, and it was to be hoped that they may be found in the matron class before another season has passed. Three-year-old mares made a small turn-out, but the general quality was first-rate. The five ticketed animals were well known in the principal showyards, where they have during the season occupied the foremost places. In respect of style and action they were not easily surpassed, but almost all of them were susceptible of improvement in the formation of their tops. The display of two-year-old fillies was altogether worthy of the Scottish National Showyard. All of the seven prize-winners had points of recommendation for first honours, and indeed have been first-prize winners at important provincial shows. In weight and substance they surpassed the three-year-old mares, and their general merits were such as to make it somewhat difficult to place them. Such weighty breeding-like stock are invaluable, and it was pleasant to find so large a number of young mares that could with confidence be commended without modification. There was quite a large class of yearling fillies, and the same remarks may be applied to them as to the two-year-olds. While by no means deficient in the essential qualities of feet

and limbs, coupled with good action, on which in Scotland so much stress is placed, they were animals of much weight and strength, and are likely to grow into very useful breeding-mares. Altogether, the show of females at Stirling in 1891 may be regarded as a first-rate representation of the present state of Clydesdale breeding in Scotland, and the general feeling must be one of satisfaction with the results arrived at.

### HUNTERS, ROADSTERS, AND PONIES.

The exhibits of hunters and hackneys were only of an average class, with the exception of the first three hunters, which were quite above the usual standard, showing great power and activity.

The sections for young stock were well competed for, several of the exhibits being very superior; evidently the breeding of hunters and roadsters in the north of England and Scotland is on the increase. The section for yearlings, the produce of the Queen's premium stallions that have served in Scotland, was a large class, and of high merit, many of the animals showing great quality, and others, although not showing such quality, were very like making useful horses.

Driving-horses were of good quality; the number, however, was small.

Pony sections were on the whole well competed for, Shetlands being very numerous, and of high standard. In the section for ponies 13 and 14½ hands, some were ridden and some led, which, in the judges' opinion, is a mistake; it should be distinctly stated whether they are to be ridden or led.

The judges also venture to think that there might be a class for thoroughbred sires and for brood-mares.

### SHEEP.

*Blackfaced*.—In the section for aged tups the entries were not very numerous, but the quality of the exhibit was excellent, more particularly the animals placed in the prize-list. The section for shearling tups was a large and meritorious one, and after the arduous work of adjudicating the prizes to animals of great excellence, still there were a number of superior animals unplaced. Ewes with lambs at foot were a strong class, and showed unmistakable signs of pure breeding. The prize pens of gimmers were good, and exceedingly well brought out. In the section for tup-lambs some very good specimens of the breed were exhibited.

*Cheviot*.—Cheviot sheep were rather a small show, particularly considering that Stirling is within easy access of the districts

where this class of sheep is principally bred, and though there were many useful sheep, it cannot be said that there were any of outstanding merit. The classes of ewes and gimmers drew attention as being of the compact well-woolled and hardy kind, which can get along on stormy land, and even compete in this respect with their blackfaced brethren. Some of the tups were of the same type; but it cannot be said that there was many of them up to the usual form of prize-takers at the Highland and Agricultural Society's Shows.

*Border Leicester.*—The Border Leicester sheep, as a whole, made a very creditable appearance indeed, with the exception of the aged tups, which were, after passing the first-prize one, only a moderate class. The shearlings, although not so numerous as usual at this great Show, contained a considerable proportion of very choice specimens of this valuable breed. The first four on the prize-list were gay, handsome, well-woolled animals, and not much to draw between them, but just a trifle to small side for some tastes. There were also a lot of very fair sheep unplaced. The ewes, though small in number, were well up in quality, and could compare favourably with former shows. The gimmers were especially good, in fact fully better than they have been for years. The first-prize pen were really grand animals, perhaps the best that the owners have ever shown, their heads, bodies, and wool being almost perfect, and very stylish as well; the second-prize ones were also a good lot, but hardly equal to the first in coat; the third and fourth pens were heavy overfed sheep, with big frames and middling wool; some of the commended ones were good useful sheep, and taking the gimmers as a class, they were the best that came before the judges.

*Shropshire.*—The Shropshire sheep, though few in number, were of good quality and character. The three prize tups in the aged section were valuable animals, and good specimens of the breed. There were no animals in the shearling section of equal merit to those in the aged. All the shearling ewes were of good character, and the first- and second-prize pens were especially good.

*Oxford Down.*—In the Oxford Down sections the first-prize shearling tup and the first-prize shearling ewes or gimmers were a long way in front of any of the other entries.

#### FAT SHEEP.

*Blackfaced wethers.*—These sheep were all of more than ordinary merit, although heavier ones at the age have been seen. They were all useful as butchers' sheep. The appearance and weight of these pens of sheep were a clear proof that

feeding blackfaced sheep young is much more profitable to the farmer than allowing them to run till three years of age.

*Cheviot wethers.*—The first prize was awarded to a well-grown lot, although slightly “patchy.” They had plenty of weight for their age. The second-prize pen, although the lightest pen of the three, were entitled to this position. They were very well bred, very evenly covered in flesh, and were worth the extreme quotation for mutton. The third-prize pen was fat, “patchy,” and fleshless, not worthy of any particular notice.

*Cross-bred wethers.*—In this section there was no competition. The single pen entered were very useful sheep, and did not seem to have been forced or overfed. They were just what a butcher would want who bought big weights; and it was considered quite sufficient to award them a second-class ticket.

#### EXTRA SHEEP.

A pen of three cross-bred wethers was awarded a very highly commended ticket. This pen, on account of its great weight, quality, and substance, was worthy of a first prize instead of a very highly commended ticket. Another pen of cross-bred wethers was highly commended. This pen also deserved something better, as they were most useful sheep of great weight.

#### SWINE.

The swine were a good lot, the best brought together in a showyard in Scotland for a long time.

#### POULTRY.

The classification was most admirable, and the system of dividing the ages and sexes is an excellent one. The birds were well staged and protected from the weather. Some cut straw or chaff should be used for the pens, and this was absent on the first day of the Show.

Dorkings at the head of the list were an excellent collection. Thanks to a few Scottish breeders are due for keeping this variety (which should always hold the premier place at an agricultural show) in its present prominent and satisfactory condition. There were some excellent specimens shown here, both in the aged and young classes. Cochins, with the exception of a few aged birds, were not good, and the chicken class was a failure. Brahmas were better in the aged classes, but again the chickens were a failure. It is perhaps worth mention that the Asiatic breeds are not popular in Scotland. Scotch Greys were an excellent show in all four classes, and show no falling off in quality. This is satisfactory, as there is an im-



pression this breed is failing in popular favour. There were four well-filled classes of Hamburgs. The blacks were especially good, and took most of the prizes. Plymouth Rocks were very disappointing. Minorcas were much better in all classes. This breed makes a farmer's fowl. They are hardy, lay a large egg, and are non-sitters. Leghorns, with a few exceptions, were not good. Langshans were few, but excellent in quality. The variety classes were notable for containing some really excellent black Spanish. The old breed is kept up by a few enthusiastic fanciers, and one of the most prominent is the successful exhibitor here. Game were disappointing for a Scottish show, but the time of year is against this breed being shown in proper feather and condition. There was a nice show of bantams. Some of the winners in the aged classes are well known, and a few of the young birds will be heard of again. There was an excellent show of ducks all through. The Aylesburys and Rouens were exceptionally good, especially in the young classes. The aged turkeys were a splendid lot, but the pens provided were not large enough for the male birds. The young turkeys were not good, and small classes. There was a good show of Toulouse geese; some monsters were shown in the aged classes.

On the whole, the show of poultry was a good one, the pooriness in some classes being more than counterbalanced by the excellent quality in others.

#### DAIRY PRODUCE.

*Butter.*—The quality, on the whole, was excellent, more especially perhaps with regard to the powdered section. Considerable difficulty was experienced in selecting the lots for the principal awards, the quality being so uniform and fine.

*Cheese.*—The cheeses were also a very fine class, those receiving the highest prizes being very well matured, and the different qualities being well developed considering the earliness of the season.

#### HIGHLAND INDUSTRIES AND FISHERIES.

There was a very fair entry of plaids, webs (light and heavy), Shetland shawls, stocking-hose, socks, and yarn; and it was generally remarked that each succeeding year the exhibits are of a better class. On this occasion the Scottish Home Industries, for the first time, exerted themselves to increase the entries, and altogether the stand was well filled with extremely creditable exhibits.

#### IMPLEMENTS.

The number of implements was not quite so large as at the Show in 1881, but nearly all the chief implement manufacturers

were represented, some of them having large entries. It may be remarked that though the Society does not now give prizes for collections of exhibits, these collections do not appear to diminish to any great extent. There were no special trials of implements,—the directors having considered that there was no implement at present in the market that required special trial.

The chief feature in the implement department was the exhibition of a new cow-milking machine by exhaustion. It was exhibited by Messrs Nicholson & Gray, patentees. The Society put up the shed and found the cows to be milked, and they were kept at the Society's expense. This proved to be a great attraction, so much so that crowds collected long before the time for milking, in the hope of getting a sight of the operation. Messrs Nicholson & Gray stipulated that they should be presented with a silver medal for exhibiting the machine, and got £10 towards the expense of bringing it to the Show.

The regulation as to burning coke in the engines in motion-yard after ten o'clock was thoroughly insisted on, which was a great advantage to the other exhibitors, as the smoke nuisance was sometimes very damaging to the appearance of the exhibits.

The Exhibition consisted of the following entries in the different classes:—

## CATTLE.

	Bulls.	Cows.	Heifers.	Oxen.	Total.
Shorthorn . . . . .	33	6	19	...	58
Ayrshire . . . . .	17	25	19	...	61
Aberdeen-Angus . . . . .	30	12	33	...	75
Galloway . . . . .	17	7	23	...	47
Highland . . . . .	34	14	17	...	65
Extra . . . . .	3	2	2	5	12
	134	66	113	5	318

## HORSES.

	Stallions.	Entire Colts.	Mares.	Fillies.	Geldings.	Total.
For agricultural purposes . . . . .	22	69	24	51	...	166
Yearlings, the produce of the } Queen's premium stallions	...	2	...	4	6	12
Hunters and roadsters . . . . .	...	...	16	2	24	42
Ponies . . . . .	6	...	5	1	4	16
Shetland ponies . . . . .	5	...	9	...	...	14
Extra horses . . . . .	2	...	...	...	...	2
	35	71	54	58	34	252

## SHEEP.

	Tups.	Ewes.	Gimmers.	Lambs.	Wethers.	Total.
Blackfaced . . . . .	71	33	15	33	...	152
Cheviot . . . . .	26	12	12	12	...	62
Border Leicester . . . . .	30	12	27	...	...	69
Shropshire . . . . .	11	9	21	...	...	41
Oxford Down . . . . .	8	6	9	...	...	23
Extra sections . . . . .	...	...	...	...	24	24
Extra sheep . . . . .	2	1	...	1	6	10
	148	73	84	46	30	381

## SWINE.

	Boars.	Sows.	Pigs.	Total.
Large white breed . . . . .	3	4	9	16
White breed, other than large . . . . .	4	3	12	19
Berkshire breed . . . . .	4	8	21	33
Extra (Berkshire) . . . . .	...	1	...	1
	11	16	42	69

	Entries.
POULTRY . . . . .	317
DAIRY PRODUCE—	
Butter . . . . .	49
Cheese . . . . .	16
IMPLEMENTS (136 stands) . . . . .	1563

The following is a comparative view of the exhibition of stock, poultry, dairy produce, and implements, the premiums offered, and the receipts (gate-money and catalogues) of each of the Shows at Stirling:—

Year.	Cattle.	Horses.	Sheep.	Swine.	Poultry.	Dairy Produce.	Imple-ments.	Premi-ums.	Re-ceipts.
1833 . . . . .	288	68	160	54	...	...	22	£553	£211
1864 . . . . .	397	181	614	76	252	...	973	1350	1729
1873 . . . . .	406	297	622	96	534	...	1400	1860	3140
1881 . . . . .	336	215	393	39	365	...	2001	2340	2577
1891 . . . . .	318	252	381	69	317	65	1563	2114	2980

## THE "BLOCK TEST" AT STIRLING SHOW.

The paper contributed to last year's volume of the 'Transactions' by Mr J. D. M'Jannet, Woodlands, Stirling, on "The Advantages of the Weigh-Bridge to the Farmer," created a great amount of interest, and the author was overwhelmed with correspondence as to his experiences. It occurred to him that a "block test," conducted in the showyard at Stirling, would be of general benefit, as it would allow his correspondents and others interested to witness a practical experiment, and judge for themselves whether the weigh-bridge was of any advantage. He accordingly communicated with the Secretary, who allowed him to proceed. Two Canadian bullocks were selected, and placed in the showyard for public inspection. They were weighed on being taken from the field on Wednesday morning, with the following result: Roan bullock (A), 12 cwt. 2 qrs.; brown bullock (B), 11 cwt. 1 qr. 11 lb. Farmers were invited to take part in a sweepstake, this plan being adopted to give additional interest to the test, the money going to those whose estimate of the dead-weight of the bullocks came nearest the actual result. There were 159 entries, and the animals underwent a thorough examination by the competitors. The estimates were written on cards supplied for the purpose, sealed and lodged with Mr D. Young of the 'North British Agriculturist,' who was to decide the competition. On each card it was intimated that the carcasses would be weighed hot, and that 2 lb. per cwt. would be deducted from weight for cooling and shrinkage, and 5 lb. for tail and kidneys, which would be left hanging on carcass. The bullocks were slaughtered on the Thursday morning, and the dead-weights of the cold carcasses were certified by Mr Young to be as follows: Bullock A, 7 cwt. 11 lb.; bullock B, 6 cwt. 1 qr. 10 lb. The nearest guesses were those of Mr James Tod, Strathmiglo, and Mr A. Munro, Kinnussie, who tied with 7 cwt. for bullock A, and Mr Hugh Lindsay, Thankerton, with 6 cwt. 1 qr. 7 lb. for bullock B. The estimates ranged from 5 cwt. 2 qrs. 10 lb. to 9 cwt. 2 qrs. for bullock A, and from 5 cwt. to 8 cwt. for bullock B. Mr M'Jannet's own estimate, based on the live-weight of the animals on leaving the field, was: for bullock A, 7 cwt. 16 lb.; for bullock B, 6 cwt. 1 qr. 26 lb. The estimate, along with the live-weight, was communicated to the Secretary before the animals entered the showyard. The discrepancy in the estimates of the 159 farmers who took part in the competition shows how far the best judges may differ as to the percentage of carcass, and proves how necessary it is to have a standard or fixed rule of guidance such as is afforded by the weigh-bridge and the tables for calculating the percentage from the live-weight. It may be

added that about one thousand persons inspected the animals during the day.

#### PRESENTATION TO MR F. N. MENZIES.

At a meeting in the Stirling Showyard on Friday, July 31, Mr F. N. Menzies, Secretary of the Highland Society, was presented with a very large antique silver drinking-quaich and three-handled silver jug by the stewards and auxiliary staff at the Stirling Show, on the anniversary of his twenty-fifth show and twenty-six years' service as Secretary (no show having been held in 1866). Mrs Menzies was at the same time presented with a gold "speed the plough" brooch.

Mr Connacher, the oldest member of the Forage staff, presided.

Sir Allan Mackenzie, Bart., senior steward, made the presentation, and spoke of the great kindness and consideration that Mr Menzies had always shown towards the staff.

Mr Menzies, in reply, said that nothing in his life had given him greater pleasure than to accept the beautiful gifts that had been given him by the working staff, and that without the co-operation and assistance of the staff the Show would not have been so successful as it had proved.

Rev. John Gillespie, Mouswald, moved a vote of thanks to Sir Allan Mackenzie for having so well expressed the feelings of the staff towards Mr Menzies. Professor Williams having moved a vote of thanks to the chairman, the staff were afterwards photographed.

The inscription on the quaich was as follows: "Presented to Fletcher Norton Menzies, Esquire of Menzies, by the stewards and auxiliary staff of the Society, on the anniversary of his twenty-fifth show and twenty-six years' service as Secretary of the Highland and Agricultural Society of Scotland. 31st July 1891."

---

#### OLD AND REMARKABLE HOLLIES (*ILEX* *AQUIFOLIUM*) IN SCOTLAND.

By ROBERT HUTCHISON, Barnhill, Brodick, Arran.

THE holly is indigenous to Britain, and is found in many districts in Scotland growing luxuriantly amongst the old forest remains, and under the shade of the survivors of those pristine plantations in large tracts throughout the country, but principally in the north-eastern counties of Scotland. In many parts of Eng-

land also it is found interspersed with old plantations and growing in quite a wild state, and to timber dimensions. It is mostly found growing wild in dry soil of various qualities. As an evergreen, the holly is probably the most useful variety we possess, for it will grow vigorously under the shade, and stands the drip of other taller trees well, and in which respect it equals the yew. Grown in congenial soil, the dark glossy polish of its evergreen prickly leaves, and the closeness of growth of its habit, render it highly ornamental, while the brilliancy of its scarlet berries in winter forms a handsome and striking contrast to its rich green foliage. Although it succeeds well in almost any soil, it does not thrive well in lofty altitudes, yet in some situations in islands on the west coast of Scotland it may be seen perfectly hardy and thriving, although stunted in growth, projecting from fissures of the rocks, and where soil of any description is scarcely attainable. Instances of this are to be found on Holy Isle, opposite Lamlash, in the island of Arran, and along the shores of Loch Lomond, and in other places.

In a natural state the holly in Scotland attains to 20 or 30 feet in height, and girths from 2 to 3 feet; but when cultivated it will grow to a loftier stature, and attain to tree-like dimensions of stem and bole. On reference to the table of collected statistics of the holly throughout Scotland, appended to this paper, frequent instances of remarkably large measurements are recorded, and to which we shall have by-and-by to refer. The holly appears to attain a larger size in England than in any other part of Europe, to nearly all the countries of which it is indigenous. Indeed, although so very generally distributed, especially if the soil be loamy or of a light sandy nature, in no country are larger or finer examples to be found than in our own. Abounding more or less in the remains of all aboriginal forests, it seems to prevail nowhere to a greater extent than in the remains of Needwood Forest in Staffordshire, and is also very abundant at the present day in the New Forest in Hampshire. In Scotland it is quite common, as we have said, in most natural woods, in the north-eastern counties of Scotland, growing as an undergrowth to the oak, ash, and the pine. "The greatest collection of hollies that we recollect to have seen or heard of," writes Sang, "grew in the pine-forest of Blackhall, on the river Dee, about twenty miles above Aberdeen." Many of the trees were very large, and furnished a great quantity of timber, which was sent to London, where it fetched a high price. Sir T. Dick Lauder, in his account of the Morayshire floods in 1829, says: "The holly is found in great abundance on the banks of the river Findhorn, in Morayshire, and the trees grow to a great size. So plentiful were they in the forest of Darnaway, on its left bank, that for many years the Castle of Darnaway was sup-

plied with no other fuel than billets of holly, and yet the trees are still so numerous, that in going through the woods [in 1834] no one would suppose that such destruction had been committed." Reference to our table of statistics gives details of some of the numerous large and noble specimens still to be seen at Darnaway (Morayshire) at the present date, which have been kindly furnished, after careful measurement, by Mr D. Scott, head forester there. They are growing at an altitude varying from 150 to 200 feet above sea-level, and luxuriating in a soil of reddish clayey loam, on a subsoil of gravel and clay and sandstone—the tallest tree being 38 feet high, with a girth of 10 feet 4 inches at 1 foot above ground. Another noble specimen is 42 feet high, with a bole of 16 feet clear, and a girth of 9 feet 9 inches at 1 foot from the ground, and 9 feet 4 inches at 5 feet up. We find hollies hardly inferior in size flourishing in red loam soil at Gordon Castle, and at Orton, at similar altitudes; and fine specimens are also to be seen at Frendraught Castle, Aberdeenshire, at an altitude of 400 feet, in a brown loam soil, upon rotten rock subsoil. So abundant are the hollies at Gordon Castle that one portion of the estate, stretching along the banks of the river, and about only four miles from the Moray Firth, and quite within the influence of its salt spray, is known as the "Holly Banks." The hollies there grow in clumps, or "tufts," as they are locally called. These clumps vary in size and circumference, the largest containing fifty-nine trees within a circumference of 50 yards. Another contains eleven stems in a circumference of 28 feet. Several of the larger individual trees are apparently on the wane, or decaying; probably partly from the recent severe winters, and the results of the influence of the salt sea-spray. Much dead wood has consequently been cut out of them, which has reduced their apparent size and importance.

It may perhaps be questioned why the area of Morayshire and Aberdeenshire, and the basins of the Findhorn, Spey, and Dee, and adjoining counties, abound so exclusively in this popular and beautiful evergreen, and why or how it comes to have been so extensively introduced into this district of Scotland? But on a careful survey of the surrounding lands and their histories, the reason is quite obvious; and the apparent profusion with which the holly has been broadcast throughout this region finds several explanations. Thus from historical and local research we find that these counties are, or have been from a very early date, fairly well furnished with trees, forest and ornamental, which yield a certain amount of shelter, ameliorating the climate in the localities in which they are growing. The holly does not do so well without a certain amount of shelter. At the same time the winters on the north-east coast are milder than in the interior

of the country, by reason of the proximity of the sea, and mitigating effects of the sea air upon temperature. During the intensity of the frost in the memorable winter of 1860-61, the highest records of temperature were found to have been at Golspie, and this was accounted for by the fact that the influence of the Gulf Stream was more apparent and marked along this part of the Scottish coast, in a curve which it distinctly took after rounding the shores of Caithness and flowing towards Sutherlandshire near this neighbourhood. Another reason why hollies are found so abundantly in this district may be that when planted in quantity by a few proprietors in the north-east, neighbouring proprietors and planters would readily adopt so beautiful an evergreen as the holly, which was found to adapt itself so well to the soil and climate along the east coast. There are very few trees of any remarkable account north of Brora, Caithness being almost bare; but from Dunrobin southwards along the coast by Dornoch, Tain, the Black Isle, Nairn, Forres, Elgin, Banff, and on to Aberdeenshire, there were many old mansions, the residences of old families who took an interest in planting. Among others may be mentioned the Earls of Sutherland, Bishops of Dornoch, who appear to have been enthusiastic planters, Earls of Cromartie, proprietors of Invergordon, Earls of Cawdor, Earls of Fife, Dukes of Gordon, and several others. So many keen planters clustered together in so limited an area could not fail to find opportunities of plying their art, and have thus left their mark on the arboricultural features of these counties in the profusion and variety of the various trees of all sorts best adapted to the soil and situations.

We have already noticed Darnaway Forest, in Morayshire, but before noticing other hollies detailed in the appendix tabulated to this paper, we may more particularly notice the details and mode of growth of some of the largest specimens in Darnaway, from detailed particulars sent us by Mr Scott, forester there. No. 1 girths at 2 feet from the ground 2 feet 11 inches, and at 4 feet also 2 feet 11 inches. Its height is 36 feet. This tree carries a straight stem all throughout, and is regularly branched to the ground. No. 2 girths 3 feet at 2 feet from the ground, and at 4 feet is 3 feet 2 inches. Its height is 22 feet, and it has also a straight erect stem, and is branched as in the case of No. 1. No. 3 girths at 1 foot from the ground, which is the smallest part of the trunk, 9 feet. Its trunk is 3 feet in length, after which it breaks into three limbs, each at 1 foot above the fork being 3 feet 9 inches in circumference, and is 40 feet high. No. 4 girths at 1 foot from the ground 9 feet 9 inches. There are three stems almost from the root, each of which is 4 feet 4 inches, 4 feet 5 inches, and 3 feet 2 inches, with boles of 15 feet fairly clean stem, and 42 feet high.



This holly and No. 3 are evincing undoubted symptoms of decay; but as a holly takes a very long time to attain such dimensions, it may linger on in its present condition for many years to come. No. 5 girths at 1 foot up 8 feet 8 inches; at 3 feet from the base it divides into three limbs, girthing respectively at 1 foot above the fork, 4 feet 8 inches, 2 feet 8 inches, and 3 feet 1 inch, and is about 30 feet in height. No. 6 girths at 1 foot from the base 10 feet 4 inches, above which point it branches off into five limbs, 3 feet 10 inches, 3 feet 8 inches, 4 feet 2 inches, 3 feet 5 inches, and 3 feet 5 inches in circumference. This is undoubtedly a very old tree; it is a very striking and romantic-looking specimen, and likely to survive for many years. No. 7 is 7 feet 10 inches in circumference at 1 foot up, when it parts into three limbs of somewhat similar proportions to No. 6. No. 8 girths 3 feet 9 inches at 2 feet up, and 3 feet 8 inches at 4 feet from the ground. It has a clear bole of 12 feet, and is 38 feet in height. It is a very fine forest specimen. No. 9 is 45 feet in height, but goes off into three almost distinct stems from the root, being 5 feet 2 inches, 4 feet 7 inches, and 4 feet 3 inches respectively; two of these boles are fairly clean for 15 feet, while the third one branches off at 7 feet, and carries a large spreading crown. No. 10 is a large bush with a bole of about 3 feet in length, and at its smallest part is 12½ feet in circumference. It branches off into thirteen limbs, girthing from 5 feet 6 inches down to 2 feet 3 inches at 1 foot above the divergence from the stem. It is a large and grand old specimen, and fully 30 feet in height. No. 11 girths 10 feet 8 inches at 1 foot from the ground—evidently three stems grown together from the root, dividing into five distinct limbs at 3 feet from the ground, with a large spreading top. No. 12 is 5 feet 5 inches in girth at 4 feet from the root, where it forks it is 6 feet 3 inches, and is 24 feet high. With the exception of Nos. 1 and 2 and the last recorded, these hollies are the largest in the forest. A considerable number of equal dimensions, as well as some larger, might be given, and almost any number from these measurements down to mere seedlings. In Darnaway the hollies can be counted by the thousand, and nearly all are of natural or spontaneous production. They grow in the forest very freely, and in some places very thickly, so much so that they have required frequently to be thinned, and for such thinnings, if from 2 to 3 inches diameter at the small end, 20s. per ton at the local railway station can easily be got.

At Dunrobin Castle, Sutherlandshire, we find splendid specimens of holly growing in a black light soil, with an admixture of sand upon a subsoil of sand and gravel, in what has apparently been at one time an old sea-bed. The depth of soil is only from 18 to 24 inches, and as it is carpeted in turf, and full

of snowdrops, the effect in early spring of the dark-green glistering foliage of the holly, interspersed with its scarlet berries, and the setting of the whole in the pure white lines of snowdrops, is very striking and beautiful. The hollies were probably planted in the times of the last Earls of Sutherland, from one hundred to one hundred and fifty years ago. They flourish, and are perfectly hardy and untouched in foliage, at about only 150 to 200 yards from the sea, and at an altitude of only 40 feet above sea-level; the site is sheltered on the north, north-east, and north-west, by woods and rising ground.

But while we have thus devoted considerable space to the notice of hollies in the north-eastern counties of Scotland, there are many splendid large examples to be found in the midland and south-western districts. A fine tree of the silver variegated variety exists at Brechin Castle, Forfarshire. It is 40 feet in height, and nearly 6 feet in girth at 1 foot above the root, and thriving well in a light loam soil, upon poor clay subsoil. In Perthshire there are many noteworthy specimens to be found, and are mentioned in our appended Table, with details of their measurements. At Gask, at an altitude of 350 feet, in a deep black loam, stands one of the tallest hollies we have been able to meet with in the course of a very general inquiry. It is 48 feet in height, with a bole of 18 feet, and is 4 feet 5 inches in girth. It is said to have been planted in 1600. In the same place we find remains of several old hedgerows,—a favourite mode of planting the holly in many parts of Scotland in the early parts of the seventeenth and eighteenth centuries. Many such often occur of very considerable height. At Gask, as in many other localities, they have evidently been originally a close hedge, and allowed to grow into tall trees after the hedge had served its purpose, for shelter or defence. They grow on each side of a circular walk round the old house of Gask, and vary in heights from 40 to 60 feet! At Monzie and Drummond Castles many fine specimens may be seen, and are recorded in our returns. At Ochertyre, Perthshire, probably the best collection of hollies of the various varieties in Scotland exists. The policy and shrubbery ground in this well-wooded and picturesque property is partly devoted to the finer species of shrubs, and is divided into sections, each of which is set apart for a particular species, and in one of these are, in most luxuriant foliage and health, very fine specimens of over seventy varieties of hollies. The altitude of the site is 380 feet above sea-level; the soil is loamy, upon a subsoil of trap-rock, and has a southern exposure. They have been planted during the present century. The hollies which abound about the parks and gardens of Monzie Castle, Perthshire, are particularly fine specimens, one hedge being 40 feet high, while single specimens

at the back of the old portion of the castle girth respectively 6 feet 8 inches and 5 feet 5 inches, at 5 feet from the ground. Many fine old hollies exist along the shores of Loch Lomond, and at Tarbert are some trees of notable size and height. In this moist situation they appear to luxuriate, and their frequency, whether as single specimens or in clumps, forms a very pleasing feature in the landscape.

In the island of Arran, at Glenkill, near Lamlash, and almost upon sea-level, there are some groups of very remarkably old hollies, probably amongst the oldest, if not the oldest, trees of the species in Scotland, and still very vigorous, although a glance will show one that their trunks are in many cases fast decaying, and are hollow. They have evidently at one time formed a hedge in what has undoubtedly been, in former days, a garden; for the field in which two of the groups stand is in spring covered with a profusion of yellow lilies and daffodils, which, springing up in rows and curves, indicate the formation of what have been walks in bygone days. No trace of house or any building can now be seen, but local tradition asserts that about two hundred years ago a schoolhouse occupied the site of this field. On one of the largest trees, in one of the groups of hollies here, is a most interesting and remarkable instance of nature's self-grafting two very dissimilar and unlikely species of wood. On one of the limbs of a holly of considerable size in the group is a fine, healthy, common ash-tree growing very vigorously and quite freely. The junction with the parent holly has been effected on a sound limb about 3 feet above ground, and the graft is now upwards of 30 feet in height, and upwards of 2 feet in circumference. The holly-limb below the point of union of the graft is 8 feet 1 inch in circumference, and at a few inches above the graft is 7 feet 3 inches. The ash-graft at the point of union is 2 feet 4 inches in girth, and at 3 feet above it measures 1 foot 11 inches. Beyond the graft, about 3 feet, the holly-limb divides into two arms, respectively 4 feet 2 inches and 5 feet 2 inches in circumference.

The name of the site, *Glenkill* (Gaelic *Gleann Cuillionn*, the valley of the hollies), probably indicates that in early times this portion of Arran was densely covered with natural wood of hollies. Many remains still are visible; and the name of a strath, only distant about four miles (*Strathwhillan* at the present day), is probably only a corruption of the Celtic *Terr-uhillan*,—or *terra*, land; *cuillion*, of the holly. Several very large old holly-trees still continue to thrive at Lamlash and neighbourhood; and in the grounds of the Whitehouse at Lamlash there are four large trees which mark the site of old Lamlash Castle. The largest of the four measures 6 feet 4½ inches in circumference at 1 foot from the ground, when it branches off

into four or five limbs, each limb being quite a tree in itself. A very old workman in the locality asserts that these four hollies were in his younger days said to have been carried from Glenkill "three generations ago, by a man named M'Bride." The foliage of these trees is now quite *spineless* or smooth, a feature frequently noticeable in old holly-trees, of their losing their prickles when very old. This is quite apparent in the lower tiers of branches in the Glenkill groups. The same change has been observed in holly-trees of old and overgrown hedges; and so much so, that reporters have sent in returns calling the variety of holly *Ilex laurifolia*, from the apparent absence of spines or prickles.

The practice of planting hollies around mansions and in pleasure-grounds as hedges appears to have prevailed very extensively in the beginning of the eighteenth century, a period when it was quite the fashion to introduce "topiary work" into gardening—a style which, although too artificial, the holly, from its great durability and patience in submitting to the operations of the shears, was found well qualified to bear, and the impenetrable surface it presents when clipped is a very important advantage for a hedge-plant. Holly-hedges may, from the same reason, be trained to a greater height than any other description, and carry with them sufficient strength to resist the heaviest blasts of wind in any exposed position; and as the holly enjoys a great immunity from the attacks of insects, the hedge always presents a healthy and lively appearance. The most notable instances of holly-hedges introduced in Scotland on an extensive scale are to be found at Tynninghame, East Lothian; Colinton, Mid-Lothian; Moredun, Mid-Lothian; and Woodhouselee, Mid-Lothian. At the last-mentioned place the hedge is upwards of 100 feet long, and is 30 feet high; that at Moredun, planted in the beginning of the eighteenth century, is 378 feet long, 20 feet high; 9 feet wide at the bottom, and 4 feet at the top. It is clipped in April annually. At Colinton the holly-hedge is a fine example, being 1120 feet in length; it was planted in 1670 and in 1780, and varies in height from 15 feet to 28 feet. It is now clipped every year. When Sabine the naturalist measured it in 1827, it was from 25 to 28 feet high, and tapered from 15 feet in breadth at the bottom to 2 feet at the top. When last measured by Colonel Trotter in 1889, the height of the hedge on the side of the square that has a southern exposure was from 39 to 40 feet, the width at the bottom being about 24 feet, and at the top from 9 to 11 feet. The other sides of the two squares are about 34 to 38 feet high, and 20 feet wide at the bottom. They are still growing fast, and are in vigorous condition. The soil is old garden-mould of great depth on rocky subsoil. The famous holly-hedges planted at Tynninghame in

the early years of the eighteenth century are now unfortunately considerably decayed, and present numerous gaps, but are still worthy examples, or rather relics, of a very important advancement in tree-culture and estate improvement of that early period. They were planted by the Countess (Ann) of Haddington of the day, who was a most enthusiastic arboriculturist, and to whom Binning Wood, and most other plantations on the estate of Tynninghame at the present day, owe their existence, and the estate its ameliorated condition, even in the bleak cutting blasts of the North Sea, which skirts the very margins of the plantations in East Lothian. The hedges, which were planted in 1712, are 2952 yards in length, and are from 10 to 25 feet high, and from 9 to 13 feet wide at the base. Single specimens occur at intervals here and there, and vary in height from 20 to 50 feet. The hedges are generally cut in April, and are carefully protected from the ravages of sheep and cattle by ditches on each side.

At Bargally, Kirkcudbrightshire, and various other places in the extreme south of Scotland, there are also noteworthy examples of holly-hedges. At Bargally one exists, planted one hundred and eighty years ago, from 35 to 50 feet high. Along the eastern border counties of Scotland, and in Northumberland, there are several remains of natural woods in which old hollies are numerous, and where they have attained to a size equal to that of many we have recorded; but most of the finest have been cut down within recent years. At Detchant, near Belford, Northumberland, there is a large natural wood in which are still many hollies of large size; but most of the largest and best have been recently cut down, and their valuable timber sold to the herring-curers to manufacture into barrels, for which purpose it is admirably adapted and highly prized.

The wood of the holly is valuable in turnery and for cabinet-work, from its fine close grain being so homogeneous, white, and very hard, and susceptible of a fine polish. It is also greatly used for veneering and inlaying, and may readily be stained to imitate various woods. The decoration of our houses and homes at Christmas-tide is a very popular and time-honoured custom, and is probably to be traced to the practice of the early Christians at Rome, where the holly had been long in use as an emblem of good wishes during the annual festival of the Saturnalia, which was celebrated about that season of the year.

APPENDIX.—COMMON HOLLY (*Ilex aquifolium*), OCTOBER 1891.

COUNTY.	PLACE.	Altitude above Sea-level.	SOIL.	SUBSOIL.	Exposure of Site.	Height of Tree.	Length of Bole.	Present Circumference of Trunk at			REMARKS.
								1 ft.	3 ft.	5 ft.	
Sutherland	Dunrobin Castle	50	{ Light, black, } { and sandy }	Sand and gravel	S.E.	ft. in. 43 6	ft. in. 6 8	ft. in. 5 7	ft. in. 5 2½	ft. in. ..	{ A splendid specimen. Well-balanced head. Growing obliquely. Fine clean straight stem and bole. Growing apparently in at one time an old sea-level.
	"	"	"	"	"	50 0	20 0	5 9	5 3	..	
	"	"	"	"	"	41 10	17 4	4 10	4 4	..	
	"	"	"	"	"	47 4	15 2	5 7	5 1	..	
	"	"	"	"	"	41 0	15 6	4 10	5 0	..	
	"	"	"	"	"	30 6	8 6	4 5½	4 5	..	..
Ross-shire	Skibo (Dornoch)	40	Medium loam	Gravel	Shel-tered S.	38 0	7 0	6 5	6 1	..	
	"	20	"	"	"	40 0	9 0	6 8	6 3	..	
	"	"	"	"	"	30 0	6 3	5 10	5 8	..	Reported to have been planted from 250 to 300 years ago.
	"	85	"	"	"	28 0	7 9	7 3	6 8	..	
	"	"	"	"	"	30 0	8 0	7 0	6 6	..	
	Brahan	90	Good loam	Sand and gravel	S.&W.	43 0	12 0	..	..	6 10	Planted in 1780.
Morayshire	Darnaway	150	{ Reddish clay } { loam and gravel }	{ Gravel and } { sandstone }	Shel-tered	36 0	7 8	..	2 11	..	Growing amongst hardwoods in forests, although some occur in proximity to firs, but majority are amongst natural oaks about 100 years old, but the hollies are much older, and have been at least 200 years planted. There are some old Scots fir in the forest, evidently the remains of a crop previous to the oaks, and the hollies appear to have been coeval with these firs.
	"	"	"	"	"	22 0	5 0	..	8 0	..	
	"	"	"	"	"	40 0	3 0	9 0	..	..	
	"	200	"	"	"	42 0	15 0	9 9	..	9 4	
	"	175	"	Gravel and clay	"	30 0	3 0	8 8	..	..	
	"	"	"	"	"	..	..	..	..	..	

CORRECTION LISTED (1865) BY THE EDITOR, 1865

COUNTY.	PLACE.	Altitude above Sea-level.	Soil.	SUBSOIL.	Exposure of Site.	Height of Tree.	Length of Bole.	Present Circumference of Trunk at			REMARKS.
								1 ft.	3 ft.	5 ft.	
Morayshire	Darnaway	150	{ Reddish clay } { loam and gravel }	Gravel and clay {	Shel- tered	38 0	2 0	10 4	..	..	{ A very old romantic-looking speci- men. This and the three preceding hollies given are clearly showing symptoms of decay. The γ branch off each near the ground into several large limbs, which in them- selves are quite trees from 4 ft. 5 in. to 5 ft. and 6 ft. in girth. ..
"	"	150	"	"	"	35 0	3 0	7 10	..	..	
"	"	160	Clay and gravel	"	"	33 0	12 0	3 9	..	3 8	
"	"	155	"	"	"	45 0	15 0	5 2	..	4 7	{ A very good forest specimen.  Branches off into three distinct stems from the ground—No. 1 at 2 ft. up is 5 ft. 2 in.; No. 2 is 4 ft. 7 in.; and No. 3 is 4 ft. 3 in.
"	"	..	{ Peaty loam and } { gravel }	"	"	..	..	4 7	..	No. 1 limb	
"	"	..	"	"	"	..	..	4 3	..	4 2 No. 3 limb	
"	"	160	"	"	"	30 0	3 0	12 6	..	..	{ A very large bush-like specimen and a grand old tree, branching off at 3 ft. into thirteen limbs from 5 ft. 6 in. girth down to 2 ft. 3 in. at a foot from divergence from stem.
"	"	150	"	"	"	35 0	3 0	10 8	..	..	
"	"	150	"	"	"	24 0	5 0	5 5	..	6 3	
"	Orton	..	Moss and gravel	"	S.W.	40 0	15 0	4 10	4 9	4 9	{ Forks at 5 ft. from ground at broadest circumference. ..
"	"	..	Garden soil	"	"	20 0	12 0	4 6	..	..	
"	"	..	"	"	"	25 0	10 0	4 8	..	..	

"	Gordon Castle	120	Red loam	.	.	{ Old red sand- stone rock }	E.	35 0	..	4 8	4 6	In one clump.	{ Growing in "clumps" along the banks, and are indigenous. The longest clump contains fifty-nine trees in a circumference of 50 yards. The girths of the largest individual trees in the clump are given.
"	"	"	"	.	.	"	"	34 0	..	..	4 9	"	
"	"	"	"	.	.	"	"	36 0	..	..	4 10	"	
"	"	"	"	.	.	"	S.E.	"	..	..	3 10	"	
"	"	"	"	.	.	"	"	30 0	..	..	3 11	"	{ This "clump" or "tuft" seems to spring all from one root. It contains eleven stems in a circumference of 28 ft. The measurements given are those of the largest trees.
"	"	"	"	.	.	"	"	28 0	..	..	3 8	"	
"	"	"	"	.	.	"	"	38 0	..	..	3 5	"	
"	"	"	"	.	.	"	"	30 0	..	..	4 0	"	{ Many individual trees have similar girths on what are called "the Holy Banks," but are decaying, and much dead wood has been cut out, which has reduced their heights. The "Banks" are only 4 miles from Moray Firth.
"	"	"	"	.	.	"	S.W.	33 0	7 0	..	8 5	7 7	
"	"	"	"	.	.	"	"	35 0	18 0	..	6 6	6 5	
Aberdeen	Frendraught Castle	400	Brown loam	.	.	Rotten rock	..	30 0	12 0	5 10	..	5 6	..
"	"	"	"	.	.	"	..	35 0	7 0	5 11	..	4 10	..
"	"	"	"	.	.	"	..	37 0	8 0	5 3	..	5 2	..
Forfarshire	Brechin Castle	..	Light loam	.	.	Poor clay	E.	40 0	9 3	5 9	..	5 1	Silver variegated variety.
"	"	..	"	.	.	"	"	34 0	10 0	5 6	..	4 10	..
"	"	..	"	.	.	"	"	38 0	8 0	5 3	..	5 0	Supposed to have been planted in 1600. There are many hollies here growing in hedgerows. Have evidently been originally a close hedge and allowed to grow into tall trees; they are on each side of a circular walk round the old house of Gask, and vary in heights from 40 ft. to 60 ft.
Perthshire	Gask	350	Deep black loam	.	.	{ Brown clay on freestone }	S.	48 0	18 0	4 5	..	4 3	
"	Kinloch, Meigie	180	Black loam	.	.	Red sandstone	S.E.	40 0	15 0	7 2	..	5 6 and 7 3 at 6 0	..



COMMON HOLLY (*Ilex aquifolium*), OCTOBER 1891—continued.

COUNTY.	PLACE.	Altitude above Sea-level.	SOIL.	SUBSOIL.	Exposure of Site.	Height of Tree.	Length of bole.	Present Circumference of Trunk at			REMARKS.
								1 ft.	3 ft.	5 ft.	
Perthshire	Monzie Castle	..	Good rich loam	Clay	S.	ft. in. 32 0	ft. in. 12 0	ft. in. 6 8	ft. in. ..	ft. in. 6 8	{ Fine specimens growing at back of old castle. Fine hedges here of holly, are 40 ft. high and closely furnished with luxuriant foliage.
"	"	..	"	"	"	34 0	15 0	6 10	..	5 8	
"	Drummond Castle	..	Sandy loam	Gravel and clay.	S.W.	23 0	14 0	4 3	..	3 11	
"	Stobhall, Muthill.	..	Light soil	Gravel	Shel-tered	30 0	..	8 8	..	3 3	{ Owing to recent severe winters, the hollies in Stobhall Wood are all "going back," and making little growths of new wood.
"	"	..	"	"	"	33 0	..	4 6	..	4 0	
"	"	..	"	"	"	36 0	..	0 9	..	4 6	
"	"	..	"	"	"	30 0	..	3 4	..	3 2	
"	"	..	"	"	"	34 0	..	6 2	..	3 8	
"	"	..	"	"	"	32 6	..	5 4	..	4 7	{ Variegated variety.
"	"	..	"	"	"	35 0	20 0	4 7	..	4 0	
"	"	..	"	"	"	30 0	..	5 9	..	4 10	
"	"	..	"	"	..	32 0	14 0	3 3	..	2 10	{ Six leaders all similar in girth on one stock or cluster.
"	Stobhall (Pleas-ance Wood)	..	Red marl	Stiff clay	S.	33 0	..	3 0	2 10	..	
"	"	..	"	"	"	27 0	..	2 0	1 9	..	
"	"	..	"	"	"	27 0	..	2 0	1 9	..	{ There are many clusters or "bovers" of similar dimensions, varying from twelve to thirty leaders each, and about 30 feet high, and averaging from 1 ft. 6 in. to 2 ft. 4 in. in girths of stems.



COMMON HOLLY (*Ilex aquifolium*), OCTOBER 1891—continued.

COUNTY.	PLACE.	Altitude above Sea-level.	SOIL.	SUBSOIL.	Exposure of Site.	Height of Tree.	Length of Boie.	Present Circumference of Trunk at				REMARKS.
								1 ft.	3 ft.	5 ft.	ft. in.	
Bute . .	{ Glenkill, Isle of } Arran	35	Light sandy loam	Rock and sand .	S. & E.	33 0	18 0	11 2	9 2	8 1		{ 6 ft. 3 in. at 9 ft. from ground. Stands in field on left hand of approach to Glenkill House from Lamash Road, and about 100 yards from the previously-mentioned group.
Mid-Lothian .	Colinton House *	..	..	..	..	..	..	..	..	..	..	..
Haddington .	Tynninghame †	80	Red loam . .	Sand and gravel.	S.	40 0	15 0	..	4 9	..	..	{ There are many other holly-trees here of similar dimensions, and quite hardy, in close neighbourhood of the sea.
" . .	"	"	" . . .	" . . .	"	35 0	10 0	..	3 0	..	..	

\* The old holly-hedges here are supposed to have been planted in the seventeenth and eighteenth centuries. They are 1120 feet in length, 15 to 25 feet in height, the width at the bottom being 24 feet, and at the top from 9 to 11 feet.

† The holly-hedges here extend to above a mile in length, and are from 10 to 25 feet in height, and average from 9 to 13 feet in breadth. In walking along them many blanks may be found, and occasionally a dead plant is met with, showing too manifestly that they are rather on the decline in point of health and luxuriance. They were planted about the year 1700, along with Blinning Wood, and when many other notable improvements on the estate were effected, and which still remain signal instances of the achievements of arboricultural enterprise at that early period.

THE UTILISATION OF WASTE PRODUCE OF FORESTS  
AND WOODLANDS.

By A. D. WEBSTER, Hollydale, Keston, Kent.

THAT the production of timber, in common with trades in general, has of late years been rendered far less remunerative than was formerly the case, and owing principally to keen foreign competition, is a fact that is now well known even to the most casual observer. In face of this, it behoves us to ask ourselves the question, Do we utilise to the fullest extent the by-products of the forest and woodland, and so diminish waste, and at the same time add to the general revenue of the forest department?

By waste produce or by-products is meant anything other than wood, or of wood not in the condition in which it is generally used, and includes bark, charcoal, firewood, house and kiln fagots, tar, wood-spirit, turpentine, sawdust, wood-ashes, leaf-soil, &c.

Fully ten years' experience in the disposal of woodland products in England, and nearly the same time spent on a large estate in Scotland, has convinced me that in the matter of the utilisation of the by-products of the forest and woodland, England, particularly the southern half, can teach Scotland a salutary lesson; for whereas in the latter many hundred pounds' worth of branches and firewood are annually either burned or allowed to rot on the ground, in England, as a rule, everything is carefully utilised and turned to the best account, and a considerably increased revenue is obtained.

That much may be done, both in the economy of production and utilisation of waste produce, is well known to those in charge of woods and forests in every part of the country: and where the by-products cannot well be utilised in any of the above-named ways, better, perhaps, reduce them to ashes; for by so doing insect and fungus life are lessened, and a valuable manure, whether for grass-land or certain farm and garden crops, obtained by the ashes, which are particularly rich in potash.

The forest by-products of Great Britain and Ireland are, in the main, applied in the four following ways:—

1. Firewood.
2. Charcoal for heating purposes, &c.
3. Bark for tanning.
4. Fagots for house and kiln purposes.

Although the British forester has usually little or nothing to do with what we might term the volatile products of the forest—tar, pitch, turpentine, rosin, wood-spirit, acetic acid, &c.—nor indeed with paper-pulp, still it may not be out of place in a paper like this to point out briefly the many minor uses to which waste timber and by-products generally are applied.

Tar, which at present is largely imported from the Baltic ports and Southern United States, is obtained principally from three species of *Pinus*—*P. palustris*, *P. pinaster*, and our native Scotch pine *P. sylvestris*.

The preparation is simple, a hole being dug in the side of a quickly sloping bank, into which the wood is heaped and covered with turf. It is then lighted from below, and in a short space of time tar exudes from the wood, and drips into vessels placed beneath to receive it.

Pitch is simply tar deprived of the volatile oils, which is brought about by boiling.

Turpentine exudes from incisions made in the stems of some of the pines, principally *P. palustris*, *P. sylvestris*, and *P. taeda*.

The common silver fir (*Abies pectinata*) produces the famous Strasburg turpentine, while the larch is the source of the Venice turpentine of commerce.

In New England the whole of the younger sapling pine—stem, branches, bark, and leaves—is made into pasteboard; while in other countries the lime and poplar are converted into paper-pulp of great value. That the great and ever-increasing demand for paper of all qualities will yet cause a corresponding demand for the material used in producing it cannot be doubted.

From the sap of the larch and Scotch firs “coniferin” is obtained; while rubber, a valuable product for mixing with gutta-percha, and which is very durable, is got from the bark of the common birch by distillation.

The value of gorse as a food for horses and sheep is well known even in this country; while in Italy poplar-leaves have long been used as cattle-food, and ground fir-needles in Styria for the same purpose.

Dried leaves make excellent litter, and they are valuable as manure; and sawdust, though without manurial value, absorbs liquid manure, and is thus used as an excellent top-dressing. Leaf-mould, too, is well known for its many uses in the garden, as also for top-dressing and mixing with other poorer soils in the making of composts for planting.

The above are some of the many uses to which the minor by-products of the forest and woodland are applied; but as these hardly come within the scope of the forester, we will omit them for the present, and devote our attention principally to the major by-products—firewood, charcoal, bark, and fagots

—and with which the British forester is most intimately associated.

1. FIREWOOD.—Never, perhaps, was the subject of English firewood more worthy of consideration than at present, when timber, speaking generally, is almost a drug in the market, and numbers of unsaleable trees are lying about on almost every average-sized estate throughout the country. Many people, and perhaps rightly too, will maintain that, particularly in districts where coal is abundant, it is very questionable whether there is any advantage from burning wood.

I am of this opinion, as I have proved that even could wood be procured at less than its present price—firewood price—it is equally as expensive as coal, as sold nowadays in most of our large towns. No doubt on many large estates where there is a superfluity of unsaleable wood it would be utter folly not to have such converted into firewood, more particularly as such work gives employment to the woodmen when the inclemency of the weather puts a stop to general outdoor work.

But this of itself is no proof that the firewood when prepared and ready for the grate is not so expensive as coal; for when the rent of ground on which the wood was grown, the felling and converting into firewood, are considered, it will be found that firewood is nearly as expensive as household coal of ordinary quality.

What will it cost to prepare a ton of firewood? is a question that is not readily answered, the cost of labour in different parts of the country varying so much. In England, generally speaking, the cutting up and stocking of a cord of fairly clean firewood—that is, when large knotty pieces which require the mallet and wedge for their manipulation are excluded—cost from 5s. to 6s. Then, How many cords of wood will make a ton of firewood? is another question that is more readily asked than answered, for the difference in weight between equal-sized logs of yew and birch is considerable.

For all practical purposes, however, we may state that about one and a half cords of wood go to the ton of firewood, thus making the cost of preparing and housing the latter about 10s. The lowest price at which I have sold a ton weight, fresh cut, was 8s.; but 10s. is nearer the usual price, or about one-half of what is usually obtained for firewood.

The cartage of this ton of wood cannot be less than 3s. Much depends upon distance, no doubt, but I usually deliver it within a radius of two miles for the price quoted. The whole matter, therefore, stands something like this: Lowest cost of a ton of wood, 8s.; cutting same into firewood and stacking, 8s.; cost of delivery, 3s.: total, 19s.

It will thus be seen that the difference in price between a ton of firewood and one of coal is inconsiderable, and every one knows which of the two as fuel lasts the longest and imparts the greatest amount of heat.

Of course where the firewood is cut up during wet weather by the estate workmen, and consumed on the estate, the matter will stand somewhat different, the two principal items, the cost of preparing and carting—both of which can be done as by-work—lessening the cost considerably. Then, in districts where the firewood cannot readily be sold, and would only rot in the woods, it is wise policy to have it cut into firewood not only for the saving of the coal bill, but for the health of the plantations as well.

In mining districts, or on the outskirts of large towns, there is usually little difficulty in getting rid of all surplus wood for firing and other purposes; but in thinly populated, outlying parts of the country, and where the cost of transit is excessive, it is then that the actual difference between a ton of coal and one of firewood has to be considered.

What wood is best for firewood is another point that well merits a share of attention in connection with forest by-products; and as I have had frequent opportunities of testing the majority of home-grown woods for this particular purpose, the result of my observations will now be given. As a rule, the heaviest wood burns longest; and for a bright and cheerful fire the elements of the wood's composition must be duly considered, as, if these are not of an inflammable nature, the wood cannot and will not burn with that rapidity and brightness which are usually desired.

Yew, where it can be had in quantity, is far preferable to any other firewood yet tried; for it burns very slowly and clearly, gives out a great heat, and emits no sparks.

Between thorn and holly I cannot well decide; but certainly, so far as lasting properties and heat-giving are concerned, they approach nearer to yew than any other wood with which I have experimented. The thorn is a sadly misused wood; for far too frequently, in the grubbing out of old division fences, the wood is burnt upon the ground, being wrongly considered as being unfitted for converting into firewood.

Amongst our forest-trees the beech, in my own opinion, produces by far the best firewood, it burning brightly, emitting a great heat, and being fairly lasting. Ash comes next, and a very pleasant fire it makes, even when used in a green state. Old oak gives out a fierce heat, but it wants a good draught to carry off the smoke. Elm I do not much care for, it making a *dour* or dull fire, although, when thoroughly ignited, it burns fairly well. Birch I think highly of, but, pine-like, it emits sparks, particularly the bark. It makes, however, a nice

pleasant fire, and burns cheerfully. Of hazel I can speak in the highest terms, but it is hard to get in the quantity desired. Sycamore firewood smoulders away, while Spanish chestnut emits sparks almost as bad as any pine; and horse-chestnut is only second-rate so far as heat-giving and lasting qualities are concerned.

Unless with properly constructed grates, the timber of resinous woods when used as firewood is highly dangerous. For my own part, I prefer a fire of Scotch fir to that of any other wood—that is, so far as a bright-burning fire is concerned; indeed, perhaps no other wood can impart that glow of comfort that is associated with the pine-log. It, however, wants constant attention, for the consumption of the wood is rapid, and the sparks are anything but safe in a carpeted room. The wood of *Pinus laricio*, owing to its containing much resin, burns like a torch, and so does that of the Austrian pine, *P. austriaca*. The wood of the Lebanon cedar I prize highly, on account of the delicious perfume given off whilst combustion is going on. In the Highlands of Scotland and southern England the roots of the Scotch pine are highly valued as firewood; while larch, when it can be got, burns with unusual freedom and great brightness. Spruce fir firewood burns nicely, but consumes rapidly. This also applies to the wood of the silver fir and cluster-pine (*P. pinaster*).

The importance of considering the best firewoods, and which of itself is sufficient reason for dwelling on them at present, will readily be acknowledged by those who have to dispose of their surplus wood to the best advantage.

2. CHARCOAL.—The chief uses of charcoal in this country are in the manufacture of gun and blasting powders, for heating hall-stoves, cooking, boiling preserves, the smelting of iron, and as a filtering and deodorising agent. It likewise occupies an important place in the making of black paint, ink, ivory, and lamp-black, and as a horticultural requisite in the packing of bulbs and for potting purposes.

In the manufacture of gunpowder, for which a highly inflammable quality is required, the three principal woods used are, the dogwood (*Cornus frangula*), the white willow (*Salix alba*), and the common alder (*Alnus glutinosa*); though not unfrequently the hazel (*Cornus sanguinea*), chestnut, and our native *Rhamnus catharticus* are substituted. Charcoal produced from the dogwood is, however, preferred to any other, it forming a very explosive powder, used for military small-arms and sporting purposes. For this purpose the dogwood is cut when an inch in diameter, and if possible when not more than of ten years' growth.



Although iron cylinders or retorts are more economical in the making of charcoal, yet for various reasons the primitive method of pit-burning is to be recommended for general estate purposes. One of the principal reasons is, that by the latter method charcoal can be made in, say, woodland or at any part of the estate where felling timber is being carried on, thus in most cases at least saving the cost of carting the wood to where the retort is set up.

The following simple and inexpensive method by which the very best quality of charcoal is produced, has been practised by me on a rather large scale for fully ten years. A piece of ground sheltered from the prevailing winds, and in a position to which easy access with wood can be obtained, is set apart for the charcoal-making; a shed is also attached in which the charcoal is stored, and a part reserved for the use of the men employed at the work. The wood is sawn into pieces 2 feet in length, and these again, should they be of large size, split to about 4 inches square, and when a sufficient quantity has been cut up for two pits, the building of these is then proceeded with. Here it should be stated that it is more economical to burn two pits at the same time, as both can be attended to during the charring process as conveniently as one, and do not necessitate the men sitting up for each separately.

The pits are of a conical shape, 21 feet in diameter and 9 feet in height, the mode of construction being as follows: A strong stake is driven firmly into the ground, and left protruding about 12 inches, around this being placed small pieces of dry wood, and standing as close to the upright stake as possible; around this being placed another layer, and so on until a circle 4 or 5 feet is obtained. Next, a circle 1 foot in diameter, and having the top of the stake firmly driven into the ground as centre, is made by placing the wood horizontally on the upright pieces, and side by side, repeating the same by laying the others on these in a similar manner until the pit is of the required height—the wood used here being dry pieces of ash if possible, 24 inches long, but split rather smaller than the ordinary pieces that are used in constructing the pit. This forms a sort of chimney, by means of which the pits are fired.

Outside the core the wood is placed on end and reclining inwards, this being continued until the pits are of the required size. The pits are then covered with newly cut turf of about  $1\frac{1}{2}$  inch in thickness, the grassy side being placed innermost, beginning at the base and working towards the top, each line of turf overlapping by a few inches the previous one, the circular hole or chimney being left open for firing.

For convenience in covering the pits the turfs are cut 1 foot in width, and any length that may be found convenient

the quantity required for two pits being seven cart-loads. We have found it a convenient plan, so as to exclude the air more perfectly, to fill up all crevices between the pieces of wood, before covering with turf, with sawdust.

The pits are fired by dropping a couple of shovelfuls of burning wood and some dry pieces of ash or pine into the opening left at the top, this then being closed by a turf, after which the process of charring commences.

During the period of burning, which, according to the state of the weather, usually occupies from seven to nine days, constant attention is necessary both day and night, as should the weather be stormy, the wind striking constantly on a particular part of the pit will cause that side to burn very rapidly, and to fall into a hole. Should this occur the hole must at once be filled with knotty logs, which had been set aside for the purpose when splitting the wood, and re-covered with turf. When the weather is mild the pits burn uniformly all over, and require little attention, and produce the finest charcoal. As the charring proceeds, the turf gradually disappears, until only a slight covering of burnt earth remains, after which, and having become cool, the pits are ready for being opened.

The charcoal is extracted by means of a rake resembling a light drag, but with much finer teeth, and after becoming quite cold is either stored away loosely or put in bags.

It should be remembered that small wood is more profitable for charcoal-making than that of large size, not only because the former requires little or no cutting and splitting, but for the main reason that it can be procured at a less cost and produces more charcoal, weight for weight. Refuse firewood, small branches, roots, &c., are what we usually consign to the charcoal-burner, all the stouter and cleaner wood being used for firewood.

Even at the present low price of charcoal, from 10d. to 1s. per bushel, there is a fair profit attached to the making of it, as will be seen from the following figures, which may be taken as about a fair standard. A cord of ordinary mixed wood, which should measure after being stacked 12 feet long, 3 feet high, and 3 feet wide, will usually, when properly burned, yield 35 bushels of charcoal, and this at the low price of 1s. will be 35s. for the produce of the cord of wood. The cost of cutting this cord of wood, which is always performed by contract, will be at the least 5s., and that of burning 7s., thus leaving a clear profit of 23s. per cord for the wood.

Even roots are made into charcoal, and I have frequently had whole woods grubbed up free of expense, or by giving the roots for the labour; but such work is usually performed during winter, when labour is at a discount.

Pinewood is not nearly so valuable for charcoal-making as hardwood, but the former is not unfrequently made to realise a profit of from 8s. to 10s. per cord of wood.

3. BARK.—The annual home supply of bark is estimated at nearly 300,000 tons, but in addition to this some 30,000 tons are imported from the Continent. For tanning purposes oak and occasionally larch bark are those principally in use in this country, though both willow and alder are largely used for the same purpose in various countries, principally Russia.

Although not at present a valuable product, still that a good margin of profit, even at the present low price of £5, 10s. per ton, will accrue through careful and judicious management, is a fact of which I am convinced. It is perhaps not generally known that of our two varieties of oak—*Quercus pedunculata* and *Q. sessiliflora*—the former contains 15 and the latter only 13 per cent of tannin. The branches, too, down to an inch in diameter, contain a relatively higher proportion of tannin than the bark of the stem.

The profits to be derived from oak-bark are so small, and depend so much on the work of stripping and harvesting being carried out with economy and despatch, that it can hardly be considered out of place in this paper to give a short notice to a method of procedure that, after many years' trial, has been found both simple and cheap.

The proper time to commence barking cannot be fixed with any amount of certainty, so much depends on the season, whether early or late, and the district of the country in which the operation is to be performed. During ordinary seasons, and in most parts of the country, bark-stripping commences during the third week in April, and continues for about a month; but in the north of Scotland the operation is frequently three weeks later. No mistake can, however, arise as to the right time to start barking in any locality, as in all cases the period when the bud is just bursting into leaf will be found the proper time for falling to ensure easy stripping and the best quality of bark. It should be borne in mind that by deferring the work beyond the time stated, there is not only a perceptible loss in weight, but a considerable deterioration in the quality of the bark as well.

Previous to felling the trees, the bark is removed from the root upwards for a distance of 3 feet, which not only prevents its being injured, but is a convenience for after-stripping as well. The trees are then felled in the usual manner, those under 6 inches in diameter being cut with the axe, but above that size it is found economy of both time and timber to fell with the cross-cut saw. Following in the rear of the cutters is

a squad of men to clear the trunk and larger limbs of all branches down to an inch in diameter, leaving the limbs to be peeled as part of the tree. Usually the bark of small branches cannot be removed quickly by the peeling-iron, and it is then that a flat stone is brought into use, beside which the peeler sits, and with one hand holds the branch on the stone, moving it along from one end to the other, at the same time applying the mallet with the other hand until the bark becomes loosened from the wood. Too frequent use of the mallet should, however, be guarded against, as all hammering or beating not only diminishes the quantity of tannin, but has a tendency to blacken the fleshy part of the bark, and cause rapid decay in a bad season.

A dry, open, and airy situation convenient to the work should be selected on which to harvest the bark, and rather than do so in a sheltered, humid spot, it should be carted to some distance off. Drying racks or ranges, 2 feet high, and sloping somewhat to one side, are easily formed of forked sticks driven firmly into the ground, these supporting stout rods placed transversely, and on which the bark is placed thinly, the larger pieces being kept on the top as a means of protection against rain. The white or fleshy side must be kept downwards, and the bark not placed thicker on the ranges than 6 inches. With favourable weather the bark is ready for stacking in a fortnight from the time it was placed on the drying-ranges.

Well-seasoned bark has the fleshy side of a creamy colour, whereas such as has been exposed to sun and rain is of a dull brown, wanting in tannin matter, and consequently deficient in value. When the bark is thoroughly dry and ready for stacking, it breaks freely across, not bending or yielding to pressure.

Larch-bark is occasionally removed from the trees for the sake of the tannin matter it contains; but as the price realised for the best quality is comparatively low, and as it is sometimes difficult to get it sold, the practice is not generally to be recommended.

Where a large fall of larch is to be taken in hand, and a contract can be entered into with the tanner for the supply of the bark removed, it may be worth while; but in most cases that have come under my notice, and where the work was most economically arranged, the price realised did not more than pay the costs.

As for the bark of the alder, willow, and pine, which are largely used in Russia for tanning purposes, these hardly come within the scope of the forester in this country, for small experiments have pointed out that such barks are not at all remunerative, at least in such small quantities as we are capable of supplying.

4. FAGOTS.—These are made of the smaller branches or spray, the remains of charcoal-wood, &c., and tied into bundles similar in size to a sheaf of wheat. They are either left lying on the ground or standing upright in threes or fours together for a few days after being made and previous to being stacked, which they always are for at least six months before being used. In thinning a woodland the fagots are usually bound up by contract at 4s. 6d. per hundred, unless when the wood is exceptionally rough and crooked, when another shilling is added. When stacked and dry they readily realise 18s. per hundred in the wood, thus giving, when we deduct a charge of 5s. for the branches, a clear profit of 13s. per hundred. This must, however, be considered as about the highest price, inferior fagots made of rougher wood realising less.

In England the demand for these fagots is great, being used either for kiln purposes, or, when chopped up and tied into smaller size, for fire-lighting. These latter are about 9 inches long and half that in diameter, and are bound tightly round the centre by tarred rope which is manufactured for the purpose. They sell readily at 3s. 6d. per hundred, great numbers being used by the London householders, in fact throughout southern and midland England.

This is a good and profitable way of getting rid of all superfluous spray and branches; and such in nine cases out of ten are, in the northern parts of Great Britain, either consumed by fire or left to rot on the ground, and so engender insect-pests that not unfrequently commit great depredations on the majority of our forest-trees.

Brush or kiln fagots, which are largely used for brick-burning, consist of all refuse woodland shrubs, such as the natural undergrowth and side-branches of the coppice-wood generally, and when tied up and dry can be readily sold at from 5s. to 6s. per hundred at the brick-kilns. They are made by contract at 2s. 6d. per hundred. By the utilisation of this otherwise waste product every twig and shrub are carefully gathered together, and the woodlands are thus kept in a neat and tidy condition.

From the above it will be seen that fagot-making is a remunerative way of disposing of all rough woodland produce that cannot well be converted into charcoal or sold as firewood. Every part of the work in connection therewith is performed by piece or contract, so that the least possible outlay is expended, thus adding considerably to the revenue of the woodlands.

MINOR PRODUCTS.—In addition to firewood, charcoal, fagots, &c., which may be considered as the main by-products of the forest and woodland, there are other minor products, such as are to be met with largely where coppice-wood is grown to any extent,

and which well repay the cost of singling out from amongst the above.

These may include flower-stakes, tool-handles, walking-sticks, barrel-hoops, &c., all of which sell readily in various parts of the country. In cutting the coppice-wood, the longest and straightest poles are selected for hop-staking, the next size for bean-stakes, and so on until every part of the wood is utilised.

Leaf-soil, too, sells readily with us at 5s. per cart-load; indeed around London and with the market-gardeners the demand oftentimes exceeds the supply. In all cases it may not be wise to remove this valuable soil from the woodland, even at the high price offered. Half-decayed leaves, too, are much sought after where market-gardening is largely carried on, they being used in the forming of forcing-beds, and for preserving plants and roots from severe frost.

*Recapitulation.*—From the above it will be seen that with us all forest produce is carefully turned to account, the body of the tree being sold as timber, all the larger branches converted into firewood, while the smaller branches come in for charcoal, and the spray is bound into fagots for fire-lighting and kiln purposes. Even the brushwood—brambles, gorse, &c.—is bound up and laid aside for the repairing of cart and bridle roads; while in certain cases, such as in felling coppice-wood, pea-boughs, flower-stakes, tool-handles, and other minor products are carefully utilised and disposed of to good advantage.

To the proprietor of Scottish woodlands in general the above methods of disposing of forest produce may seem somewhat mythical, but that such is not the case I have ample testimony to bring forward were such required.

Compared with Scotland the acreage of woodland in England is far less in proportion to the population; while, as coal-fields are few and far between, the demand for firewood is consequently greater. Then in Kent, Surrey, and Sussex—indeed the southern English counties generally—the demand for all kinds of forest produce is great, and ever on the increase, owing to their proximity to London.

The cultivation of hops is another great stimulus to the timber trade in south England, for hundreds of acres of coppice-wood are cultivated solely for the production of hop-poles, and cut over at stated periods, averaging from twelve to fifteen years. The whole crop may not be suitable for this particular purpose, but the demand for other smaller-sized stakes and fagots renders it a matter of no difficulty to get the whole produce of the woodland disposed of. Coppice-wood, suitable in part for hop-poles, realises in Kent from £5 to £6 per acre, and as such a class of wood can be grown on ground that is

practically almost worthless for farm crops, it will be seen that the investment is a fairly remunerative one.

Then charcoal is in great demand for drying the hops, so that all refuse wood, particularly such as is cut in outlying districts, is charred on the spot and sent to the nearest market, the cost of carriage adding but little to the expenses connected with manufacturing.

In Scotland, particularly the northern parts, wood cannot be turned to account in the various ways we describe, but that much more might be done than at present I have long been convinced. Fagots, if properly made and sold in the wood at from 2s. 6d. to 3s. per hundred, would soon supersede, as they are fast doing in England, the bundles of wood that are now so commonly used for fire-lighting. They are not only cheaper, but last longer, and emit greater heat.

Where the carriage of firewood comes to nearly as much as the wood itself costs—and this will occur in many thinly populated districts far removed from towns—the best way is to have it converted into charcoal, the carriage of which, owing to its lightness, adds but little to the original cost of preparing.

When we consider how valuable waste forest-produce is in England, and that every part of the tree is turned to some profitable account, it at once dawns upon us that, in northern parts of our island, where so much excellent wood is annually wasted either by reducing it to ashes or allowing it to rot on the ground, something might be done to check this waste, and so render the woodlands more remunerative than they are at present. By extending the manufacture of charcoal, which sells readily enough anywhere, as also the making of fagots for fire-lighting, much might be done to assist in accomplishing this end.

The firewood industry, too, might be largely increased if owners of woodlands could be induced to deliver it at a lower price than at present. I tried the experiment on a large estate in the north of England and found it to answer well, the best class of firewood being sold at 5s. per cart-load; and when horse labour was not pressing at more important work, the wood was delivered a distance of two miles, a little more or less, for 2s. extra, thus bringing the price of the load of wood when delivered to the purchaser to 7s.

By so doing I largely increased the sale of waste forest-produce in the short period of ten years, a man and horse being constantly employed delivering firewood and branches, the latter realising 3s. per load for oven-heating and fire-lighting.

These prices, although low, left a good margin of profit when all expenses were deducted; but whether or not, the plan had its advantages; for as the wood could not otherwise have been readily disposed of, better do so at the prices quoted than have

it reduced to ashes or left to rot on the ground, and so engender insect-pests that of late years have committed great ravages in our woodlands and plantations.

## THE CEREAL AND OTHER CROPS OF SCOTLAND FOR 1891, AND METEOROLOGY OF THE YEAR RELATIVE THERETO.

### THE CROPS.

THE following comparison of the cereal and other crops of 1891 with the previous year, has been prepared by the Secretary of the Society from answers to queries sent to eminent agriculturists in different parts of the country.

The meteorology of the year has been furnished by Dr Alexander Buchan, Secretary of the Meteorological Society of Scotland.

The queries issued by the Secretary were in the following terms:—

1. What was the quantity, per imperial acre, and quality of grain and straw, as compared with last year, of the following crops? The quantity of each crop to be stated in bushels. What quantity of seed is generally sown per acre?—(1) Wheat, (2) Barley, (3) Oats.
2. Did the harvest begin at the usual time, or did it begin before or after the usual time? and if so, how long?
3. What was the quantity, per imperial acre, and quality of the hay crop, as compared with last year, both as regards rye-grass and clover respectively? The quantity to be stated in tons and cwts.
4. Was the meadow-hay crop more or less productive than last year?
5. What was the yield of the potato crop, per imperial acre, as compared with last year? The quantity to be stated in tons and cwts. Was there any disease? and if so, to what extent, and when did it commence? Were any new varieties planted, and with what result?
6. What was the weight of the turnip crop, per imperial acre, and the quality as compared with last year? The weight of the turnip crop to be stated in tons and cwts. How did the crop braird? Was more than one sowing required? and why?



7. Were the crops injured by insects? State the kinds of insects. Was the damage greater or less than usual?
8. Were the crops injured by weeds? State the kinds of weeds. Was the damage greater or less than usual?
9. Were the pastures during the season of average growth and quality with last year?
10. How did stock thrive on them?
11. Have cattle and sheep been free from disease?
12. What was the quality of the clip of wool, and was it over or under the average?

From the answers received, the following statistics have been compiled:—

MID-LOTHIAN.—Wheat was not so bulky a crop as last year; deficient in straw; about 40 bushels; seed, three bushels. Barley, fully a better crop than last year, but got an awful shake with the wind; will average about 40 bushels; seed sown, 3 bushels. Oats, less crop than last year; deficient in straw; average, 46 bushels; seed, 4 bushels sown. Harvest began about the same time as last year, 1st September. Hay, about 2 tons 5 cwt., 10 to 15 cwt. less than last year; quality much the same. Meadow-hay, none. Potato crop—Regent potatoes were very bad, with disease commenced in September; yield, 5 tons bad and 3 of good; other varieties, such as Bruce and Magnums, about 7 tons; scarcely any disease. Turnips, about 25 tons; fine quality; fine braird; only sown once. No injury from insects or weeds. Pastures scarcely so good as the previous year—too much wet weather. Stock throve, and were free from disease. Clip of wool, average.

WEST LOTHIAN.—Wheat, about the same in quantity and quality as compared with last year; from 30 to 40 bushels; seed, from  $2\frac{1}{2}$  to 3 bushels. Barley, about the same quantity and quality of straw; grain better than last year in quantity and quality; from 30 to 40 bushels; seed, from  $2\frac{1}{2}$  to 3 bushels. Oats, less in quantity of both grain and straw as compared with last year; quality about the same; from 28 to 38 bushels; seed, from 4 to 6 bushels. Harvest began and ended about the same time in the lower district, but in the higher district it would be fully a fortnight later. Hay, less in quantity, about the same in quality as last year; from 1 to 2 tons. Meadow-hay, good, but very little grown in the district. Potatoes, better in quantity and quality as compared with last year; from 4 to 8 tons; some disease in the early kinds. Turnips, not so good in quantity, but about the same in quality as last year; from 10 to 12 tons; in some cases did not braird well; some second sowing, owing to dry weather. No damage by insects. Crops not injured by weeds. Pastures not so good as last year. Stock did not thrive well, but were free from disease. Average clip of wool.

HADDINGTONSHIRE (Upper District).—Wheat, very little grown. Barley, 26 to 32 bushels, of good quality, but a little high-coloured; straw good;  $3\frac{1}{2}$  bushels sown. Oats, 36 to 40 bushels, of good quality; straw not so bulky, but of better quality than last year; 4 bushels sown. Harvest began same time as last year, 10th September. Hay, 30 to 40 cwt., of fair quality. Meadow-hay, less than last year, and much damaged by wet weather. Potato crop, 6 tons; Regents very much diseased; Magnums and Main-crop very little diseased. Turnip crop, 16 to 18 tons; only one

sowing. Diamond-back moth-caterpillar did some injury to turnips, but not material. No great damage done by weed—some fields had rather much wild mustard. Wet cold weather in early summer kept back pastures, which were not so good as usual. Stock not in such good condition as they might have been. Cattle and sheep free from disease. Clip of wool good, and about average.

**HADDINGTONSHIRE** (Lower District).—Wheat, 36 to 40 bushels ; as much straw as last year ; both grain and straw as good quality ;  $3\frac{1}{2}$  bushels sown. Barley, 40 bushels ; fine quality, not quite so much straw ;  $2\frac{1}{2}$  bushels seed sown. Oats, 40 bushels, fine quality, straw short of last year ; 4 bushels seed sown. Harvest began 17th August, same time as last year ; weather at first rather showery and backward, and followed by a high wind, which shook a good deal, causing considerable loss in some parts. Hay, quantity about the same as last year,  $1\frac{1}{4}$  ton ; fair mixture of ryegrass and clover ; showery, but notwithstanding it was generally pretty well got. Meadow-hay, none. Potatoes, 6 to 7 tons ; better crop than last year ; Regents very much diseased, later kinds not quite so bad, but all more or less diseased. Turnips, better crop than last year, 21 tons ; braided well ; one sowing ; along the coast turnips were affected by the diamond-back moth, and in some cases very seriously. No injury by weeds. Pastures much the same as last year. Stock did fairly well. Cattle and sheep free from disease. Wool, full average clip ; good quality.

**BERWICKSHIRE**.—Wheat, 31 bushels ; grain and straw average quality ; 3 bushels for seed. Barley, 34 bushels ; grain and straw above average quality ; 3 bushels for seed. Oats, 30 bushels on the heavy lands, and 36 on the light ; grain and straw of good quality ;  $4\frac{1}{2}$  bushels for seed. Harvest began about ten days after the usual time. Hay, quantity short of last year and quality poor ; much damaged by rain ; as a rule, 1 ton 5 cwt. Meadow-hay, very poor and generally damaged. Potatoes, about  $\frac{1}{3}$  less—4 tons ;  $\frac{1}{4}$  diseased and of bad quality. Turnips—swede larger than last year, yellow much the same ; 18 tons ; braided well ; on the east coast the crop was injured by insects (diamond-backed moth), but over the county the damage was not great. No great extent of injury done by weeds. Pastures, poor quality, and stock did not do well on them, but were free from disease. Clip of wool, good average.

**ROXBURGHSHIRE**.—Wheat, 28 bushels ; not much sown in the district ; seed, about 3 bushels ; an average crop, both as to grain and straw. Barley, an average bulk of straw ; about 32 bushels grain ; seed, generally 3 bushels. Oats,  $\frac{1}{3}$  less bulk of straw than last year, and about 34 bushels grain ; seed, about 4 bushels. Harvest began about a week later. Hay, a little under last year's crop ; about  $1\frac{1}{2}$  ton. Meadow-hay, a good crop, but much damaged with weather. Potatoes, a good crop ; about 6 tons, but much diseased, with exception of the Bruces and the Main-crops, both new sorts ; the Regents scarcely pay for dressing. Turnips won't average more than 18 tons, but a most irregular crop ; on good deep soils a heavy crop, but on thin wet land or badly farmed not half a crop, with a good deal of disease (finger-and-toe). Crops very little damaged by weeds. Pastures neither the quantity nor quality of last year. Stock scarcely up to average. Cattle and sheep very healthy. Clip of wool about average.

**SELKIRKSHIRE**.—Wheat, none grown. Barley, 30 bushels quantity, and quality much the same as last year ; seed,  $3\frac{1}{2}$  bushels. Oats, 34 bushels quantity, easily 4 bushels less ; quality deficient ; straw good, but nearly  $\frac{1}{2}$  less ; seed  $5\frac{1}{2}$  bushels. Harvest began about 8 days after the usual time. Hay, not much grown ; 1 ton 10 cwt. ; quality fair ; quite  $\frac{1}{3}$  less quantity,

owing to cold spring and dry weather in beginning of summer. Meadow-hay very much less productive, and in many cases totally spoiled. Potatoes, principally grown for home use; about 1 ton more than last year;  $\frac{1}{2}$  diseased, except some new varieties, which were free; disease commenced beginning of September. Turnips, 15 tons; both quantity and quality deficient from last year; braided well; one sowing. Not much damage done by insects; some fields a little by the caterpillar. Little injury by weeds. Pastures, very deficient; had to be supplemented with artificial food. Stock thrived fairly well; no doubt the feeding helped. Cattle and sheep fairly healthy. Clip of wool, quality average, quantity under average.

**Peeblesshire.**—No wheat. Barley, about 30 bushels; crop under average, but somewhat similar to last year. Oats, say 32 bushels; very deficient in bulk of straw. Harvest began about the average time, but was much protracted owing to stormy weather; however, as it was accompanied with high wind, grain did not suffer so much in the stock as might have been expected, and crops were in most places stacked in good condition, and kept well. Rye-grass-hay crop was very poor—less than the previous year—and would not exceed 2 tons; there was a great scarcity of clover. Meadow-hay was about an average crop, but in the uplands much of it was destroyed by floods and wet weather; on many hill-farms hardly sufficient was secured to fodder the shepherds' cows. The yield of the potato crop was good—much better than the previous year; about 6 tons; there was a considerable amount of disease. Turnip crop would average about 14 tons, a less crop than last year; owing to the wet summer and autumn its growth was checked; it braided well; early sown turnips were, as usual, generally the best. No injury done to crops by insects. Weeds were difficult to keep down, owing to the rain. Pastures were not nearly so good as last year: in Tweedsmuir district, towards the end of the year, mice have increased to a great extent, and are doing damage to the hill pastures, especially where the soil is deep and the grass is strong, giving them shelter in the fog and moss at the bottom. Stock did not thrive very well. There has been no disease. The quality of wool was good, but the clip was under the average, with falling prices.

**Dumfriesshire (Upper Nithsdale).**—Wheat not grown. Barley not grown. Oats, 25 bushels, with a short crop of straw; seed sown, 6 bushels. Harvest began after usual time, 10 to 14 days; weather most unfavourable; prolonged harvest, with large quantities of grain secured in bad condition. Hay about half the quantity of previous years; short crop, not an average; 1 ton; naturally poor in quality, but well secured; no clover in the crop or aftermath. Meadow-hay, about half a crop, and, owing to continuous rains, poor in quality; all kinds of fodder far short of requirements, and now at famine prices. Potatoes, 8 tons, and free of disease. Turnips, much heavier crop than previous year; 20 tons; braided well, and no resowing necessary; though the best crop of the season, the expectations of early summer hardly realised. Little damage from insects, but wood-pigeons becoming a most serious pest; would attribute the increasing scarcity of clover to their ravages. No serious injury from weeds, the hot dry weather of early summer allowing of their easy extermination. Cold dry weather in spring prevented an early growth, and the drought in summer completed the mischief; pastures never showed anything like average growth. From want of sufficient grass both sheep and cattle were in poor condition in autumn, and made most unremunerative prices. Cattle and sheep free from disease. Clip of wool, good quality and average weight.

**Kirkcudbrightshire.**—Wheat, about 28 bushels; straw under average;

quality poor; seed, about  $3\frac{1}{2}$  bushels. Barley, about 30 bushels; straw very short; quality indifferent; seed, about 4 bushels. Oats, about 33 bushels; quantity much under last year, and quality also worse; straw *very* short, but good in quality except in late farms, where some crops nearly wasted by bad weather in October; seed, 5 bushels; grain crops generally deficient, owing to cold spring and want of rain in summer. Harvest began about ten days earlier than usual, say 20th August, finished about 20th September, except in some cases where, owing to bad weather, crops stood out in the field during October. Hay crop, about 25 to 30 cwt.; much under last year; quality fine. Meadow-hay much less productive; quality inferior. Potato crop from 6 to 10 tons; much better than last year; very little disease except in a few early sorts; commenced about end of August; new varieties, Bruce and Main-crop; results satisfactory. Turnip crop, from 16 to 20 tons; better than last year; quality rather coarse, owing to wet October; crop braided well; little or no resowing. No injury by insects. Charlock prevalent in corn crop, owing to backward spring. Pastures, quality fair, but growth very deficient. Stock thrived fairly. Cattle and sheep free from disease. Average clip of wool; quality good.

WIGTOWNSHIRE.—Wheat, 30 bushels; quality fair; straw, 1 ton; 3 bushels seed used. Barley, 32 bushels; quality of grain fair, but straw short; crop much lighter than last year;  $3\frac{1}{2}$  bushels seed used. Oats, 36 bushels; quality good; crop greatly deficient in grain, and very much so in straw;  $4\frac{1}{2}$  bushels seed used. Harvest a week earlier than usual. Hay,  $1\frac{1}{2}$  ton; quality fair, where got early, but later damaged by rains. Meadow-hay much less productive, caused by the exceptionally dry summer. Potatoes, 6 tons; much better and sounder crop than last year; very little disease. Turnips, 16 tons; much better crop than last year; the crop braided well where early sown, but later sowings did not braid so well, owing to drought; no more than one sowing required. No injury by insects. No injury by weeds. Pastures very short and poor, the worst for many years; stock had also to be turned out early, which was against the growth. Stock thrived not well; there was a great deficiency of food all through the season. Cattle and sheep free from disease. Clip of wool good; a fair average.

AYRSHIRE.—Wheat was a good crop; there was less straw than in 1890, but it was of better quality; the amount may be put at 40 bushels as an average; seed about  $3\frac{1}{2}$  bushels. Barley was a better crop than the previous one on deep soils, but it was poor on light porous land; the weight of straw was under an average; the yield of grain, 38 to 40 bushels as an average; seed, 4 to 5 bushels. Oats were a very small crop on light early land, but the bulk was more satisfactory on deep inland soils; the yield of grain was large in proportion to the amount of straw; some inland crops reached an average, but the whole cannot be put higher than 36 bushels; straw not more than  $\frac{2}{3}$  of an average; seed, 4 to 5 bushels. Harvest a little earlier than usual. Hay crop very light, but fine in quality; amount, 20 to 25 cwt. Meadow-hay from  $\frac{1}{3}$  to  $\frac{1}{2}$  less than crop of last year. Potatoes—the earliest crops were the smallest that have been raised for many years; the next in order, ready for raising in August, were good; they gave 6 to 8 tons; the late crop was also good, yielding on average fully 7 tons; not much disease. The turnip crop was extra good on well-managed land in early districts; on inland farms it was also good where regular braids were got; crops of 30 tons and upwards were weighed from well-manured land in Carrick; on the whole, turnips were over an average. No special injury by insects or weeds. Pastures deficient everywhere from beginning to end of season; the worst for a long series

of years. Stock did as well as could be expected, considering the scarcity of food. Clip of wool, a full clip of good quality.

BUTE.—Wheat, none grown. Barley, inferior crop both as regards grain and straw; about 30 bushels; seed sown, 4 bushels. Oats, inferior crop also; about 34 bushels; seed sown, 5 to 6 bushels; straw about  $\frac{1}{2}$  under the average. Harvest commenced on 14th August, about ten days before usual time; finished later than usual, owing to wet season. Hay, the quantity and quality under the average; hay about  $1\frac{1}{2}$  ton; timothy about 2 tons. Little meadow-hay in this island; not so productive as last year; badly got. Potatoes, a good average crop; about 8 tons; very little disease; commenced in August; no new varieties worth noting. Turnips, from 20 to 30 tons; quality excellent; crop braided well; no resowing; *the* crop of the season. No injury of consequence by insects, and none to any extent by weeds. Pastures bare all season, owing to backward weather in May and June; milk stock had to be hand-fed during a considerable part of summer. Stock did not thrive well. Cattle free from disease; sheep suffered from "braxy," which was worse this year. Clip of wool about the average.

ARRAN.—No wheat or barley grown. Oats, about 32 bushels, and 2 lb. per bushel lighter than last year; straw  $\frac{1}{2}$  less than last year, on account of the dry season; quality better; seed about 6 bushels. Harvest ten days earlier than usual. Hay very light crop, scarcely 1 ton. No meadow-hay. Potato crop scarcely so good as last year, but quality better; about 4 tons 10 cwt.; a little disease began in the end of August; no new varieties. Turnips scarcely so good; about  $13\frac{1}{2}$  tons. Swedes injured by pigeons after braiding, by taking the young plants and the leaves after thinning; no insects. No injury by weeds. Pastures not so good. Stock throve not very well; too dry the beginning of the season, then too much rain. No disease. Clip of wool rather under average.

LANARKSHIRE (Upper Ward).—Wheat, none. Barley, very little grown; what is, about average. Oats, from 30 to 40 bushels; average about 35 tons; on the lighter dry soil of this district a very thin crop, and deficient to the extent of one-third at least of both straw and grain from last year; on the heavier land in the low part of this district the crop fine, but much below average. The cause of the deficiency was the drought in May, June, and July; the crops here were stunted before rain came, afterwards a part of it was spoiled through the wet and protracted harvest; fodder scarce and dear. Harvest began about the usual time. Hay from 1 ton to 1 ton 10 cwt.; quantity less than last; quality about the same—at least one-third less quantity. Meadow-hay, one-third less. Potatoes, from 6 to 10 tons, about one-half more than last year; Regents about one-third diseased, commenced about 10th week of October; Magnums and Bruces almost free of disease; Bruces coming in with, I hear, good results. Turnips, from 20 to 35 tons; quality better than last year; quantity about one-third more than last year; braided well; no second sowing. Crops injured less than usual by insects, but very much by weeds. Wild kale very bad—worse than usual; and other weeds after the rain came. Too dry and cold at the beginning of season, too wet at end of it, for good pastures. Stock throve fairly well, and were free from disease. Clip of wool, rather under average.

LANARKSHIRE (Middle Ward).—Wheat, a good crop; ripened well; threshing well; yield, 40 bushels; straw, 150 stones ( $22\frac{1}{2}$  lb.); seed sown, 3 to  $3\frac{1}{2}$  bushels; quite as good a crop as previous year. Barley, little grown; yield, 40 bushels; seed sown, 4 to 5 bushels. Oats, very deficient crop; straw very scarce; yield from 35 to 40 bushels; seed sown, 4 to 5

bushels ; sample of oats not equal to former year. Harvest began a week earlier than previous year ; fairly good weather ; crop secured in good condition. Hay, small crop ; 1 to 1½ ton ; quality good. Meadow-hay, average crop ; very unfortunate as regards weather ; good deal of it spoiled. Potatoes, good crop ; yield from 8 to 10 tons ; Regents only variety that was diseased, but few of them planted ; mostly Magnums and Bruces planted ; these had no disease. Turnips, yield 20 to 30 tons ; braided well ; no resowing ; some extra crops of swedes. Nothing of any consequence by insects. Owing to dry summer, weeds easily killed. Owing to drought, pastures did not do well ; grass was very scarce. Stock did not do too well ; feeders made little improvement, but young beasts thrived fairly well. No disease. Clip of wool, an average.

LANARKSHIRE (Lower Ward).—Wheat, 40 bushels, and quality good ; quantity of seed sown, per acre, 3 to 3½ bushels. Barley, almost none grown in the district. Oats, 42 bushels ; quality good ; straw short ; on late cold land a good crop, but on light land a very short crop. Harvest began about the usual time ; this year we began on August 21, last year we began on September 8. Hay, about 1 ton 8 cwt. ; quality good ; but little clover compared with last year ; a much lighter crop. Meadow-hay, about 2 tons this year ; about 3 tons last year. Potatoes, about 7 tons this year ; last year about the half ; about one-fifth part diseased, and began near the end of September ; Bruces and Majors, and with almost no disease. Turnips, about 18 tons per acre ; quality better than last year ; braided well, with only one sowing. No injury by insects. A little wild mustard in oats in some places. Pastures very bare, on account of dry summer. Stock thrived not very well ; they had to be fed artificially nearly all summer. Cattle and sheep pretty free from disease. Little or no sheep in the Lower Ward.

RENFREWSHIRE (Middle Ward).—Wheat, from 40 to 48 bushels ; straw at least one-third less ; seed sown, generally about 4 bushels ; grain was, if any, but slightly deficient, but straw was considerably less. Barley, not much grown ; produce, about 36 bushels ; straw, about one-third less ; seed sown, about 4 bushels. Oats, a fair yield of grain, from 32 to 40 bushels ; straw in many cases not more than a half, but all over fully a third deficient ; seed sown, about 6 bushels. Harvest began about middle of August, fully earlier than usual. Rye-grass hay, as a rule, was got in good condition ; unless on the best land, would not average more than 1½ ton ; timothy also mostly well got ; would average about 2 tons. Meadow-hay, about one-fourth less. Potatoes were a much more abundant crop than last year, running from 6 to 10 tons ; should say 8 tons a fair average ; disease to the extent of one-fourth among Regents and other fine varieties ; but Champions, Magnums, Bruces, &c., were all but free. Turnips scarcely up to last year's average ; average about 16 tons ; a braird, as a rule, got with first sowing. No injury by insects or weeds. Pastures considerably deficient. Stock thrived fairly well, and were free from disease ; not a sheep district.

RENFREWSHIRE (Upper Ward).—Wheat, not much grown ; about average crop ; 32 bushels. Barley, none. Oats were a light crop ; too much dry weather ; average produce, 30 bushels ; straw light ; very little sold. Harvest, about the usual time. Hay, light crop. Rye-grass from 25 to 30 cwt. ; quality good ; price from £4 to £5. Meadow-hay was light, and much damaged by wet weather. Potatoes were a fair crop ; from 5 to 6 tons ; Regents about £4, later sorts £3. Turnips were also an average crop ; none damaged by insects. Crops were very free from weeds. Pastures

did not do well, owing to cold spring and dry summer. Cattle and sheep did not thrive well, but have kept free from disease. About average clip of wool.

RENFREWSHIRE (Lower Ward).—No wheat and no barley grown. Oats—crop, in consequence of the dry season, was deficient, and this was especially the case on the drier soils, but on the colder and later lands a better crop was obtained; the yield was less than in the previous year, and may be stated at from 20 to 26 bushels; the crop of straw one-third less. The harvest looked at one time as if it was to be a protracted one, but there was a good breeze, which helped materially to prevent injury arising, and the crop was fairly well secured in the higher districts; but in the lower, wet weather, and the breezes having less effect, retarded operations. Harvest began about a week earlier than usual. The quantity of seed sown is from 4 to 5 bushels. Rye-grass hay suffered very much from the dry season; and while the weather was favourable for securing the crop, the quantity was about 5 cwt. to 15 cwt. less, and clover was very deficient. Meadow-hay was also less in quantity by about 8 cwt., but the quality was excellent. The potato crop benefited very much by the dry season, and there was hardly any disease, and that which did appear was first visible about the 1st of September. The yield varied from 4 to 7½ tons. Magnum Bonums and Bruces showed mere traces of disease. Turnips were in some districts a good deal injured by the fly, and resowing was necessary; the crop, as a whole, was a good one, and the weight per acre may be stated as about 16 tons. The diamond-backed moth was seen here and there, but its ravages fortunately were not serious in the district, thunder-showers probably arresting its progress. Red-land oats were injured by wire-worm, and the lea oats by grub; oats were also a good deal injured by the charlock weed, it being in some localities unusually troublesome. The pastures were extremely late in starting, and a more bleak and ungenial spring and first part of summer have seldom been experienced; indeed up to the second week of June no signs of growth in the pastures appeared, and the wintry weather which prevailed so late, continued east wind, and the dry months of June and July, told very much on the pastures, and graziers suffered, the stock being kept very much back in condition, and the pastures were over-stocked from their not providing the feeding which the grazier had calculated on. The season was much more favourable for keeping down weeds in green-crop land. The district has been free of disease; hill stock have done fairly well; the clip of wool about an average; but prices of stock were much lower than in the previous year. The rainfall for 1891 has been 60.85 inches; April, May, June, and July, especially the latter two months, were remarkably dry, and a water famine threatened in some localities; the general reputation, however, of the district was well maintained, for the following months and the month of December almost beat the record for moisture, the rainfall reaching 12.26 inches, October 1874 recording over 13 inches. The distribution of rainfall over the year is somewhat remarkable, the first seven months registering 20.48 inches, and the last five months 40.37 inches. There have been a few more dry days, 1891 having 152, as against 141 in 1890.

ARGYLLSHIRE (District of Lochgilphead).—Wheat, none sown. Barley, none sown. Oats, a fair average crop, and all safely got; 4½ bolls of 6 bushels; about 6 bushels sown. Harvest began about usual time—if anything rather earlier. Hay crop under average; 1 ton 5 cwt. Meadow-hay crop lighter. Potatoes, good average crop; 7 tons; sound crop, little disease. No new varieties that I am aware of. Turnips, a good sound crop; 20 tons swede, and fully that of yellow and red tops. They braided well; one sowing only. Pastures deficient. Stock thrive

fairly well, considering the deficiency, and were free from disease. Clip of wool, quality good average clip.

ARGYLLSHIRE (District of Kintyre).—Wheat, none grown. Barley, from 32 to 35 bushels; quality of grain, good; straw much lighter than last year; 4 bushels sown. Oats, 35 bushels; crops in general lighter than last year; straw good, but deficient in quantity; 4 or 5 bushels sown. Harvest commenced about 1st September, much about the same time as 1890. Hay crop very light; about  $1\frac{1}{2}$  ton. Very little meadow-hay grown in this district; about 2 tons. Potatoes, from 6 to 7 tons; much better both in quality and quantity than last year. Turnips about 17 tons; quality generally good; crop lighter than last year. No injury by insects or weeds. Pastures not nearly an average, and quality inferior to last year. Stock thrive fairly well. No disease on good land, slightly diseased on high cold land. Clip of wool, quality good and quantity above an average.

ARGYLLSHIRE (Islands of Islay, Jura, and Colonsay).—Wheat, none grown. Barley, almost none grown. Oats, quantity rather less than last year; 6 bushels sown on lea, and from 4 to 5 on fallow. Harvest about a fortnight later than last year. The hay crop was much lighter than last year; meadow-hay much less productive. The potato crop was much heavier than last year; very little disease until late on in the season. The turnip crop braided well, and in few cases was more than one sowing required. The crop is lighter than last year, owing to wet and cold weather during the latter part of the season. Caterpillars proved somewhat destructive to the leaves of turnips, but not much more so than was the case last year. Weeds not so rank as usual. Pastures, quantity considerably less, but quality somewhat superior. Stock thrive not so well as might have been expected. Cattle and sheep fairly free from disease. Clip of wool, not quite so good as the average, either in quality or quantity.

ARGYLLSHIRE (District of Inverary).—Wheat, none grown in the district. No barley either. Oats, a lighter crop than last year; perhaps from 26 to 28 bushels; straw considerably lighter, and not well saved; grain and straw shed and damaged. Harvest began about a week later than last year. Rye-grass and sown grasses a light crop; would not average more than 23 to 25 cwt.; fairly well saved. Meadow-hay, a much lighter crop, unless when top-dressed. A long dragging harvest, very badly saved, and much lost altogether. Potatoes, a fair average crop, but early varieties much diseased; Champions again did best; Bruces good also. Turnips generally a very good crop; from 20 to 36 cwt., and sound; no second sowing required. No damage by insects. Weeds were not more than usual. When oats were thin and short, a red weed prevailed. Pastures, average quantity and quality; stock thriving on them. Stock thrive well, and were free from disease. Clip of wool, about an average.

DUMBARTONSHIRE.—Wheat, 30 to 34 bushels; quality of grain and straw not so good as last year, owing to very bad autumn and harvest weather; 3 bushels sown. Barley, very little grown; crop about 33 to 36 bushels; quality moderate, not equal to last year;  $3\frac{1}{2}$  bushels sown. Oats, on low lands, 38 to 45 bushels; on poor hill lands, 27 to 33 bushels; straw, about 25 per cent less than last year; quality of both inferior, especially straw; 4 to 5 bushels sown. Harvest began about usual time; later than last year, which was early; was protracted by bad weather. Hay, about 1 to  $1\frac{1}{2}$  ton; say about 30 per cent less than last year, owing to abnormally dry weather from February to June; secured in fine order. Meadow-hay, very deficient in quantity and quality; much deteriorated by wet harvest.



Potatoes, better; about 7 to 9 tons; some disease among Regents late in season; of newer varieties, Bruce, Sutton's Abundance, and British Queen were most popular. Turnips, very fine crop; from about 14 tons on moorland farm to 23 and 28 on lowland; braided well; resowing merely a fractional proportion. No injury by insects or weeds. Pastures very bare and unprofitable, owing to the almost total absence of rain from February till end of June; autumn rather more grass. Stock thrived fairly well latter part of season; badly earlier, for reasons given above. Cattle and sheep free from disease. Clip of wool, good average.

**STIRLINGSHIRE (Western District).—**Wheat, none sown. Barley, about 33 bushels; much the same as last year; seed,  $3\frac{1}{2}$  bushels or thereby. Oats, about 35 bushels; fair quality; not so much straw as last year, but generally well secured; seed about 4 bushels. Harvest a few days earlier than last year. Hay, rather a light crop; 28 cwt.; fairly mixed with clover, and secured in good condition. Meadow-hay, fair average crop, generally well secured. Potatoes, about 8 tons; fine quality; disease about 10 per cent, setting in first week of September; no new varieties planted. Turnips, about 23 tons; good crop and fine quality; good braided. Not many insects. Pretty free from weeds. Pastures, not much growth till near the end of June, owing to cold weather. It improved as the season advanced, but stock did not thrive any better than last year. All stock free from disease; wool much the same as last year.

**STIRLINGSHIRE (Eastern District).—**Wheat, 38 bushels; the quality of both wheat and straw not so good as last year, and quantity larger than last year; 3 bushels sown. Barley, 36 bushels; quality of grain not so good as last year, on account of wet harvest, a good percentage of grain being slightly sprouted; straw, both quantity and quality, being very deficient;  $3\frac{1}{2}$  bushels sown. Oats, 32 bushels; quality inferior, owing to continued wet harvest weather; straw very short, and too ripe before harvested; 4 bushels sown. Harvest a little later than last year, by being protracted. Hay, carse land, 2 tons; quality good; dry field, 1 ton; too short on account of dry weather. Meadow-hay less productive. Potatoes, about 9 tons; disease not so prevalent as last year. Swedes, 16 tons; quality not so good as last; yellows, 13 tons; very poor: crops braided well, and no second sowing required. Turnips suffered from insects, which completely destroyed crops in some fields. No injury by weeds. Pastures not so much growth as last. Too cold; stock did not thrive well. Clip of wool, quality and quantity not so good as last year.

**FIFESHIRE (Eastern District).—**Wheat, 34 bushels; straw,  $1\frac{1}{2}$  ton; 3 bushels sown; quality of grain and straw about same as last year. Barley, 32 bushels; straw, 1 ton; 3 bushels sown; quality of grain and straw better than last year; 6 bushels lost by shake. Oats, 30 bushels; straw,  $1\frac{1}{2}$  ton; 4 bushels sown; owing to dry summer crop, much under last year; 4 bushels lost by shake. Harvest began usual time. Wet, troublesome, expensive harvest. Hay crop under last year,  $1\frac{1}{2}$  ton; quality not so good as last. Meadow-hay, about  $1\frac{1}{2}$  ton; very little grown. Potatoes, 6 tons, larger crop than last year. Regents, fully half diseased. Magnums, about  $\frac{1}{2}$  diseased. Bruces, free of disease. Champions,  $\frac{1}{2}$  diseased. Main-crop Kidney, small cropped, but free of disease. Turnips, 14 tons; crop under last year; quality good. Braided well. No resowing. Farmers round sea-coast suffered much from diamond moth. Pasture, under average growth and quality. Stock thrived only middling, but were free from disease. Clip of wool, quality good, average clip.

**FIFESHIRE (Middle District).—**Wheat, about 32 bushels. The yield of

crop equal to last year; also quality. The straw, however, scarcely so tall, and the weight of straw not so heavy. One and a quarter ton would be above the average return of straw. Barley—this crop was not so bulky, and the yield of grain not so much as last year; 34 bushels of grain and 18 cwt. of straw would be about an average crop. The quality has been good, good colour and good weight per bushel (fully 55 lb.) Straw, also good quality. The oat crop was more deficient than either wheat or barley—generally very short in the straw, and the yield correspondingly short; 34 or 35 bushels of grain and a ton of straw would be an average return. The harvest began about the usual time in the district—in the last week of August or the first week of September. Hay crop was very deficient in weight. The crop was deficient in clover. The drought of June and the cold weather of May had a very prejudicial effect on the yield of this crop, about a ton. Potato crop was heavier than last year, but the Regent variety was very much diseased—on most farms, to the extent of one-half of the whole crop. About  $2\frac{1}{2}$  tons of dressed tubers would be an average yield. Magnums and Bruces were a good crop, and free of disease; yield about 5 tons. Champions were considerably diseased. Clark's Main-crop Kidney was grown to a small extent; good cropper and fine quality; will take the place of the Regents. Turnips, not nearly so good as last year. The ravages of the diamond-back moth, especially amongst swedes, had an appreciable effect in diminishing the weight of crop. The crop braided very irregularly, especially on heavy land. The drought of June too severe, and many fields did not braird until the rains in the beginning of July. This crop will be under average—11 tons of yellows, 14 tons of swedes. The turnip crop was the only crop injured by insects. Very little of the turnip beetle, and a great deal of diamond-back moth. Never knew this moth hurt the turnip crop. Very little injury to crops by weeds. Pastures not so good; scarcely up to average. Stock thrive fairly well; no disease. The clip of wool, both as to weight and quality, was up to average.

FIFESHIRE (Western District).—Wheat, 34 bushels;  $1\frac{1}{2}$  ton straw; quantity of grain and straw much as last year; quality fully as good. Seeding, 3 bushels. Barley, 36 bushels; more bulk of both grain and straw than last year, but no better in quality; seeding, 3 to  $3\frac{1}{2}$  bushels. Oats, 40 bushels; quality of grain and straw much as last year, but quantity of either decidedly less; seeding, 4 bushels. Harvest a few days later than usual. Hay crop a little over a ton; under an average, both in quantity and quality. Meadow-hay less bulky, and badly got. Potatoes, 5 tons; less in quantity, and deficient in quality, as compared with last year, especially on strong heavy land. Turnips, 14 tons; crop under an average. Early lands especially suffered from caterpillar, but all over the yield will be short. Crop braided well, and only one sowing required. Pastures as a rule were poor, and under average both in growth and quality. Stock thrive badly, but were fairly healthy, and free from disease. Clip of wool, average.

PERTSHIRE (South-West District).—Wheat, a good crop, fully 2 bushels more than last year, about 62 lb.; seed, 4 bushels. Barley, a fair average crop, both as regards grain and straw; yield from 34 to 36 bushels; weight, say 55 lb.; seed, 3 to 4 bushels. Oats, one-third under average, both grain and straw (much shaken); natural weight, 42 lb.; seed, 5 bushels. Harvest about ten days later than previous season, and long continued, owing to broken weather and scarcity of farm-labourers. Hay, one-third under average; about 1 ton; quality good. Meadow-hay, a deficient crop, badly damaged by weather in many instances. Potatoes, an average crop, and pretty free of disease, say six tons; about £2, 10s. per ton.

Turnips, considerably under an average crop, say from 12 to 15 tons. Sown more than once in many cases. Crops injured by insects. Weeds not in great quantities; land easily cleaned. Pastures did badly in most districts—dried up in the early part of season. Stock only thrived fairly well on pasture. Cattle and sheep free from disease. Clip of wool much the same as last year in quantity and quality.

PERTSHIRE (District of Coupar-Angus).—Wheat, from 36 to 41 bushels; weight, from 63 to 64 lb.; average crop. Barley, 40 bushels, weighing 53 lb.; bulk of straw,  $\frac{1}{4}$  less than last year. Oats, 30 to 48 bushels; straw,  $\frac{1}{4}$  less than last year. Harvest commenced 17th August, same time as last year. Hay, average crop, about 1 ton; well mixed with clover. No meadow-hay. Regents, from 6 to 9 tons generally;  $\frac{1}{4}$  diseased. Magnums and Bruces, from 6 to 9 tons. New variety, Fiddler's Taunt, 10 tons; little disease, but few grown. Turnip crop very varied, from 10 to 20 tons; and where moth destroyed, little or no crop, especially where late sown. Weeds, much as usual. Pastures, very much under average. Stock thrived very indifferently. Cattle and sheep free from disease. Clip of wool, average.

PERTSHIRE (Western District).—Wheat, none grown. Barley, none grown. Oats, an average crop; 30 to 36 bushels. The harvest commenced at the usual time. Hay crop, light; 1 ton 15 cwt. Meadow-hay, less productive, and very badly got. Potato crop, very good; 7 to 8 tons. Turnip crop, good. No damage by insects. No damage by weeds to any extent. Pastures, not so good as last year. Stock did not thrive so well, owing to the wet harvest. Both cattle and sheep have been free from disease. Clip of wool, quality good, and a good average.

PERTSHIRE (District of Strathearn).—Wheat, very little sown in this district; average crop; 32 to 33 bushels; 3 bushels sown. Barley, a fair average crop; 40 bushels; not well coloured for want of sunshine;  $3\frac{1}{2}$  to 4 bushels sown; very much laid and twisted by storms of wind and rain. Oats, an average crop; 35 to 40 bushels; grain fairly well filled, but straw in many cases short, in consequence of want of forcing weather in May and June. Harvest fully a fortnight later than last year, being very protracted, owing to heavy rains; stocks in upland districts being sprouted, and much damage done by twisting and lodging of the grain. The hay crop was, if anything, under the average, in consequence of cold and unfavourable weather during May and June;  $1\frac{1}{2}$  ton; secured in good condition. Meadow-hay was also under an average crop, but well secured. The potato crop was a full average one; 6 to 8 tons, notwithstanding that the earlier varieties were considerably diseased; disease began in July, but did not make much headway among the later varieties. Regents were particularly affected by the disease, and have kept very badly in the pits. Turnips are under an average crop; 12 to 15 tons; a good seed-time was experienced, especially for swedes, but the cold wet weather in the end of May and June retarded the growth of the braird, and helped to make the crop a lighter one than otherwise it would have been. Very little, if any, second sowing was required, but grub at a later period of the season was most destructive in many parts of the district. The caterpillar plague was almost unknown. There was no injury to crops by insects, except in exceptional instances from fly on turnip braird. There was little or no damage done to crops by weeds, with the exception of a few instances where wild mustard was seen; damage less than usual. The pastures were fairly good, but late, and not of such feeding quality as in a warm dry season. Stock thrived fairly well, and where caked were early ready for the market. Both cattle and sheep have kept quite free of disease.

The clip of wool was an average one as regards quantity, and of fair quality.

**PERTHSHIRE** (Highland District).—Wheat, none. Barley, straw not so plentiful as last year; yield, 32 bushels; weight, 52 lb.; quality, fair; seed, 4 bushels. Oats, straw not so plentiful; thin on the ground, but quality good; yield, 42 bushels; weight, 40 lb.; seed, 5 bushels. Harvest began about the same time as last year. Hay, light; about 16 cwt.; clover not so good. Meadow-hay, less, and very bad. Potatoes, fair crop, about last year's average,  $3\frac{1}{2}$  tons; earlier kinds diseased, say about a sixth part; later kinds very little diseased; the disease began about the middle of August; no new varieties. Turnips, not so heavy as last year, about 17 to 18 tons; brairded very irregularly, but got on fairly well afterwards; very little second sowing. No injury by insects. Very little damage by weeds—about same as usual. Pastures not so plentiful or luxuriant. Stock throve not so well as previously. Cattle and sheep free from disease. Clip of wool a little under the average quantity; quality slightly inferior.

**PERTHSHIRE** (District of Dunkeld and Stormont).—Little wheat grown; 24 bushels; 62 lb.; both grain and straw less than last year; spring very cold, and June very dry; 4 bushels sown. Barley, 32 bushels; weight, 54 lb.; straw short, owing to drought; seed, 4 bushels. Oats, 38 bushels; weight, 42 lb.; straw very short; frost in May, very dry in June. The harvest was about the usual time, the beginning of September. Hay was a light crop, about 1 ton; quality good. Little meadow-hay made. Potato crop good; 5 to 6 tons; a little disease among Regents commenced about 1st September; Bruce planted doing very well; good croppers, free from disease. Turnip crop not good; 5 tons; quality fair; fair braird, except on strong land, where the seed did not come till rain came, and then not very regular; considerable damage done by fly. Little injury done except some turnips in brairding, and a good deal of injury in summer. Little injury by weeds. Grass was long in coming, and short all summer; quality fair. Stock throve pretty well, but not full bite. Cattle and sheep free from disease. Clip of wool, average.

**FORFARSHIRE**.—Wheat, yield 44 bushels; quantity of seed sown, 4 bushels; straw good quality; grain very good. Barley, yield 40 bushels; quantity of seed sown, 4 bushels; straw good quality, but not so abundant as last year; grain very good and heavy. Oats, yield 56 bushels; good quality; on one place near Dundee I hear that 13 quarters were threshed of excellent quality; the straw of this crop is generally very deficient, but quality very superior. Harvest commenced a week earlier than last year. Hay, 1 ton 15 cwt., but in some districts very deficient in clover. Scarcely any meadow-hay made in this county. Potatoes, 8 tons; Regents about half diseased, other varieties comparatively free; no new variety unless on a small scale. Turnips, not an average crop; not exceeding 17 tons. This crop brairded well, but was badly eaten with diamond-backed moth. Where they were early and well grown they got fairly well over it, but where late it nearly ruined them. Pastures, not over-abundant, but of good quality. Stock throve well, and were free from disease. Clip of wool an average.

**ABERDEENSHIRE** (District of Buchan).—Wheat, not grown. Barley and bere, fair crop, although not equal to last year as to yield, nor the weight so heavy. Yield, average 4 quarters 4 bushels; weight from 49 to 52 lb.; from 3 to 5 bushels sown. Oats, not nearly so bulky a crop as last year, although it turned out better when put into the stackyard than was at one

time anticipated. All over this part of the county the crop suffered severely by the excessive rain and strong gale that occurred on the 21st September. Straw, owing to the crop being well secured, of good quality, but not the quantity of last year; weight of oats, 38 to 42 lb.; from 5 to 6 bushels sown; yield, about 1 quarter under that of last year. Harvest commenced last year about 13th September, this year about 7th September, and finished about the 12th October. The hay crop was about an average as to quality, but not nearly the same extent as last year, owing to keep of stock being scarce at the commencement of the grass season, and the demand for early grass by sheep-owners, who had then on hand a larger number of sheep than usual; secured in fairly good order; well mixed with clover; the yield would be from 28 to 34 cwt. Little meadow-grass in the district. The yield of the potato crop in too many instances was not over a quarter of a crop, and these were much infected by disease; on some farms where the quantity was nearly equal to a fair crop, a great number were diseased, and it is thought that there will be a scarcity of good seed. The turnip crop is not an average crop—at least one-third of an average under that of last year, and very variable. Where the turnips were got in pretty early in dry open-bottomed land, the yield is a fair one; but where the sowing was retarded too long, especially in damp and sour-bottomed land, the yield is not half a crop, and in many cases not over one-fourth of an average crop. Turnips are, and will be, scarce and dear to obtain, for the excessive rain and strong gale of 21st September did an immense deal of damage to the turnip crop, and the weight will be, for Swedish, 14 to 20 tons, and yellows, 12 to 18. This would not include fields where they are almost a failure, for at least all over the crop will be one-third under that of last year; quality fair; the braird came away evenly, and the result was very little resowing. Injury to some extent, although not general, was done by the beetle, which was much more this season than previously. In many fields the weeds were too prominent—in fact, it was an exception to see a properly cleaned field of turnips this season, owing to the wet weather. The pastures generally were never luxuriant, owing to stock having been too soon put on, and not sufficiently relieved to allow the grass to get away. Stock only made fair progress, as the season was too changeable for stock improving as they would do in steady genial weather. Stock in general have been free from disease, only a few isolated cases of pleuro having occurred in the district. Clips of wool about the average, and the price nearly equal to that of last year.

ABERDEENSHIRE (District of Formartine).—Wheat, not grown to any extent in this district. The crops of barley and bere were generally good, although not so much straw as last year. Last year the cereal crops were much above an average in this district; this year the yield of grain would be about 34 to 38 bushels, and the weight 53 to 56 lb.; 4 bushels barley and 3 bere sown. Oats were also a fair crop; not nearly so much straw as last year; and the quantity of grain about one-third less than last year; 28 to 32 bushels; quantity sown, 5 to 6 bushels. Harvest commenced this year on the third week of August, about a week or ten days later than last year. The hay crop was secured in very bad order, and was much under last year; during the hay season the weather was very wet, and it was only on some farms that the hay was got into stack by being early cut before the weather became so wet, in any kind of condition. No meadow-hay. The potato crop generally was a poor crop, owing, no doubt, to the wet season; the tubers were small in size, and have not kept well in the pits; disease showed itself amongst the early sorts in the month of August; Champions and Magnums were freest of disease; quantity about 4 to 5 tons. The turnip crop is about the worst crop that has been in the district for a number of years; a good field is the exception; the earliest sown turnips

are far the best—in fact, the turnips sown after 28th May are next to a failure : turnips in this district are realising three times the price paid for turnips last year to be eaten on the ground by sheep, and cannot be had for money. No injury done by insects. Weeds were more difficult to be kept under this year amongst the turnips, owing to the wet weather. The pastures were never abundant the whole season ; the weather during the summer was cold and wet, and the grass never got ahead of the stock, hence the cattle and sheep made little or no progress on the pastures. Cattle and sheep have been free from all infectious diseases. The clip of wool was a good fair average.

ABERDEENSHIRE (District of Garioch).—No wheat sown. The crops of barley were generally good and yield fairly satisfactory, but 4 bushels under last year, corresponding to 38 bushels, and weighing 54 lb. ; the usual seeding is 4 to 4½ bushels. The crop of oats after lea bulked well, but thin and deficient after turnips ; in a few exceptional cases the out-turn is equal to last year, but in the majority a shortcoming exists to the extent of 6 to 8 bushels, which brings down the average yield to 31 bushels, and weight 41 to 42 lb. ; the usual seeding is 6 bushels. Harvest was commenced about a fortnight later than usual. The hay crop was about the same as in previous years, but a deal of it was got badly harvested, which has told upon its feeding value very considerably ; the mixture of rye-grass and clover was quite even, and the weight 1½ ton. No meadow-hay. The crop of potatoes is much under last year, and the tubers of small size, with a deal of disease, especially amongst the early varieties ; even the Champions, which have withstood the disease hitherto, are now more or less affected ; disease does not appear to have seized the Bruce variety. Turnips—where the bulk of the crop was laid down previous to the second week of June, the results have been fairly good, but not equal to last year ; those sown after that date, from the dryness of the land, braided unequally, followed by a superabundance of moisture, prostrating the plant, which never assumed its wonted vigour, hence that portion of the crop is of light weight, and in many cases a failure ; 12 tons may be assumed an average ; rarely a second sowing was required. The crops suffered nothing from insects, but owing to the wet weather, as above stated, couch-grass amongst the turnips was not got so well subdued as might be. The pasture afforded a very good bite throughout the season, but the weather before and for some time after Whitsunday was very cold ; cattle lost condition, and by the time they were housed the advantage gained in weight was very small, but both cattle and sheep were remarkably healthy. The quantity and quality of the clip of wool was similar to last year.

ABERDEENSHIRE (District of Strathbogie).—There is no wheat grown in Strathbogie now, very little barley, and the area under bere is annually decreasing, and the acreage of oats increasing. Farmers are finding the results from oats more satisfactory, the straw being of greater feeding value, and better adapted for stock purposes. Much of the oat crop, where heavy, was laid early in the season by one or other of the frequent and excessive rain-falls with which the district was visited last summer. Where the crops were laid early, the quality of the straw was much deteriorated, and its feeding value much reduced as a consequence. Where crops were not laid, straw was of good quality and abundant. The crop, as a rule, is not yielding satisfactorily. Indeed the fields that were early knocked down are giving very bad results, the grain being of remarkably poor quality, and weighing only about 38 lb., and there is an unusually large quantity of light of no practical value. Where the crop was grown on good land and not laid, the straw is of fine quality, and the return of grain would be about forty bushels. Harvest was about a week later than the average season.

Hay was not a good crop ; in many instances there was a marked deficiency of clover, and owing to the unsatisfactory season, rye-grass was also light ; great difficulty was experienced in curing the crop and securing it in the stackyard. Potatoes, where planted in land tending to dampness, were practically a failure ; in many cases tubers were little larger than ordinary plums, and the quality was of the most wretched description. Most farmers will have to purchase seed and take the sets from a distance. The turnip crop is the worst that has been grown since the cold frosty season of 1879 ; many farmers, being badly off for roots, will be put to a considerable expense for artificial food in bringing their stock through to grass. On soft land the crop braided fairly well, but the plants generally came slowly to the hoe. The failure of the root crop must be attributed to the condition of the soil, together with the wet and unseasonable weather. In a season when the crop is so variable and so far below the average, it is difficult to give a fair approximation of the weight of turnips, but it may safely be said that generally the crop is rather under half an average. Owing to excessive and continued rains during cleaning time, there was a greater amount of weeds in turnip-fields, but no particular damage resulted. Pasture fields during the early part of the season were remarkably bare, and the fields that were eaten very bare did not do particularly well as summer advanced. Stock of all kinds were healthy, but, probably owing to the cold wet weather, did not do well on grass. The clip of wool was rather over an average weight.

BANFFSHIRE (Lower District).—No wheat. Barley, 30 bushels ; quality of both grain and straw not so good as last year ; quantity about 8 bushels less than crop 1890, and 3 to 5 lb. lighter. Oats, 32 bushels ; quality of grain good as regards colour, but not so heavy as crop 1890 by about 2 lb. per bushel ; quantity and quality of straw about as good as last year. Harvest began about same time. The hay crop was, generally speaking, poor, deficient in clover, and quality greatly deteriorated by wet weather during haymaking ; quantity perhaps about 1 ton to 1½ ton. Very little meadow-hay, but perhaps about same. Potatoes, fully less than half the crop of 1890 ; a good deal of disease in soft loamy land. Same applies to turnips ; less than half the crop of 1890 ; crop braided well ; little, if any, resowing. There was some appearance of caterpillar on the turnips, but came to little, being destroyed, I think, by a severe rain-storm before getting far alength. Turnips to some extent injured by weeds, it being impossible, from the extreme wetness of the season, to get them the usual cleaning. Pastures were spoiled by the excessive wet. Stock thrived only middling ; they did not come off the pastures so well forward as usual. Cattle and sheep free from disease. Clip of wool about same.

MORAYSHIRE (Lower District).—Wheat, as compared with last year—which was not a good wheat year—was, as to quantity and quality of grain, inferior, the cause being too much moisture and want of sunshine. On the best well-conditioned soils the crop was very badly laid ; the yield from such would not be over 2½ qrs. of very inferior grain ; the average would not exceed 3 qrs. 6 bushels, and the weight fully 2 lb. below the average ; the straw was of good quality and well harvested, and considerably above average bulk ; seed used, 3 to 4 bushels. Barley was a good crop as to bulk of straw, but the season was too wet and sunless to make good colour and quality of grain ; the quantity was under the average of grain yield, 34 bushels ; weight 54 to 56 lb., of rather dark colour ; the crop was well harvested, but on good soils badly laid, which made the straw rather inferior in quality ; seed used, 2½ to 3½ bushels. Oats, on account of the moist season, turned out a very bulky crop, but on good land badly laid, but not so much injured from that cause as wheat and barley ; the

yield would be 38 bushels, and where not too much laid, good well-coloured grain, weighing 42 to 44 lb. ; the straw above average in bulk, and when not laid of good quality ; quantity of seed used, from 3 to 4 bushels. Harvest was not general till the first week in September, which was fully a week later than the average of seasons, but the weather was very favourable ; the crop was secured in very good condition ; the laid state of the crop made the work very tedious and expensive ; a good deal had to be cut with the scythe, being too much laid for the reapers. Hay was a very good crop, both as regards rye-grass and clover ; the quality was good, except in cases where it lay too long in the swathe before it could be gathered ; the quantity would be 2 tons, but there was not the usual breadth, on account of the scarcity of spring keep for stock, which curtailed the area for hay. No meadow-hay in this district. The potato crop, as was the case last year, was a good deal injured by disease, which commenced about the 1st of September, before the tubers in general were fully matured, which lessened the quantity and quality of the crop : in many cases early varieties, such as Fortyfolds, disappeared altogether ; the quantity would be from 2 to 5 tons ; not any special new varieties planted. Turnips in general very much below the average in weight ; in some cases where the land was damp the crop was exceedingly poor, but even on the best turnip land the weight would be a good many tons below the average ; the quality appears good in the best crops, cattle thriving fairly well on them ; the weight would run from 14 to 20 tons ; little or no second sowing, as the crop braided well, owing to the moist state of the soil. Little or no injury to crops from insects, excepting some cases where the leaves of the turnips were a little eaten by some kind of small green grub. Turnips were, in many cases, to some extent injured by weeds, owing to the wet season ; no drying to kill the weeds when stirred by the horse- or hand-hoe. Pastures grew fairly well, but as stock had to be put out very early upon them, they were kept rather bare during the season, and did not afford the usual amount of keep for stock ; quality, average ; and stock thrived fairly well on the pastures. No disease among stock. Clip of wool, about the average.

NAIRNSHIRE. — Wheat, none. Barley under last year—34 bushels ; quality fair, in some parts little spoiled by lodging ; straw over. Oats, 40 bushels ; about average. Harvest, about two weeks later. Hay, good ; rather over last year. Potatoes, average ; a little disease. Turnips, much under average ; not over 12 tons ; braided well ; canker, owing to wet season. Pastures, during the season, of average growth and quality with last year. Stock thrived on them fairly well, and were free from disease.

INVERNESS-SHIRE (District of Inverness). — There has been very little wheat sown in this county for many years ; last year there were not over 50 acres sown in the county ; the quality was good, and the yield would average about 38 bushels ; the quantity of seed sown is from 3 to 4 bushels. Barley was a very deceptive crop as regards quantity, there being quite 4 bushels less return than in 1890 ; the yield would not exceed 30 bushels, an average on light lands ; the quality is good ; there was plenty of straw ; the quantity sown is from 3 to 4 bushels. Oats were a large and abundant crop on all good land, and were a full average yield throughout the county ; the harvest being favourable, the samples were excellent ; there was no damage done to any crop during 1891 ; quantity sown, from 3 to 5 bushels. Harvest was rather later than usual. On well-farmed lands there was an excellent crop of hay, especially where top-dressed ; the season was rather backward for haymaking, but was, on the whole, well secured ; yield varies from 1 to 2½ tons ; no meadow-hay grown. The yield of potatoes would be about one-third less than 1890, but with the



exception of some early varieties, very little disease exists; from 5 to 6 tons would be an average of the most prolific sort, such as Bruce, while from  $3\frac{1}{2}$  to 5 tons of other sorts would be an average. The turnip crop was very varied in this part of the county, but when compared with many districts, it compares favourably; on good well-conditioned soils there were several farms along the Beaully Firth with crops of from 25 to 30 tons, but on light land east of Inverness there were some poor crops; finger-and-toe appeared on several farms; very little of any second sowing. There was no damage done by insects. The most destructive weeds are wild mustard and knot-grass; there was, however, no unusual quantity prevalent. During the early spring grass was scarce, but it afterwards grew abundantly, and pastures were generally luxuriant. Stock thrived much better than in 1890 on pasture. There has been no infectious disease in the county. The quality of wool was an average, the preceding winter being very favourable for sheep.

INVERNESS (District of Beaully).—Scarcely any wheat grown in this district; and this season, under the average for quantity and quality, say  $3\frac{1}{2}$  qrs.; about 4 bushels seed used. Barley, under last crop for quantity, but of fair average quality, and threshing about 36 bushels; seed generally used, 5 bushels. Oats, under the average of last year in quantity and quality, threshing about 32 bushels; average seed used, 6 bushels. Harvest about three weeks behind the average. Hay was about an average crop for quantity, but of very inferior quality to last year; quantity about 1 ton 5 cwt. Meadow-hay—none grown. The potato crop was fully a third less than last year; average bulk about 3 tons, with a large percentage of disease, which began about middle of August. Turnip crop was very unequal, and could scarcely be averaged; some fields very good, others lying alongside a failure, but the average would be under last; came well to hoe, but took disease immediately after. Finger-and-toe—greater. No harm from weeds. Pastures above average growth, but quality under, and stock thrived badly. Cattle and sheep free from disease. Clip of wool, fully an average.

INVERNESS-SHIRE (Skye).—Wheat, none grown in this district. Barley, none grown in this district. Oats, a good crop, but damaged by wet weather. Harvest began at the usual time. Hay, an average crop as to quantity, but inferior in quality. Meadow-hay, not so productive. Potato crop was better than an average, both as to quantity and quality; no signs of disease; no new varieties; the Champion principally grown. Turnips, owing to the ravages of caterpillar, a very poor crop, not more than half the average. White caterpillar—greater. Pastures of average growth and quality with last year. Stock did not thrive well early in summer, but thrived well in autumn, and were free from disease. Clip of wool, quality good, under the average as to weight.

INVERNESS-SHIRE (Lochaber).—Wheat, none grown. Barley, scarcely any grown. Oats, quantity about 30 bushels; straw inferior to, and not so bulky as, last year, the result of very late and backward spring; seed about 6 bushels. Harvest began about usual time. Hay, quality not so good, quantity about 1 ton. Meadow-hay, less, and difficult to save. Potatoes, yield in some places 10 tons; a good deal of disease among Regents and other early varieties; the Bruce tried here for the first time, producing a very fine crop, and entirely free from disease. Turnips, about 14 tons; much affected by finger-and-toe; crop braided well, and required no second sowing. Oats after green crop suffered considerably from weeds, the more so from shortness of straw. Pastures, below average. Stock

throve not so well as usual, but were free from disease. Clip of wool fair, rather under than above average.

ROSS-SHIRE (Western District).—Wheat, none sown. Barley, little or none sown. Oats, quantity 28 bushels; quality fair; 7 bushels sown. Harvest two weeks later than usual. Hay, quantity  $\frac{3}{4}$  of a ton; quality fair. Meadow-hay crop less productive than last year. Potatoes, yield better; about 8 tons; little or no disease; no new varieties. Turnips, yield about 8 tons; quality not so good, owing to finger-and-toe. Pastures not of average growth and quality. Stock throve fairly well, and were free from disease. Clip of wool, quality good; fully an average clip.

ROSS-SHIRE (Districts of Dingwall and Munlochy).—Wheat, breadth grown much as last few seasons; quantity of grain average, say 34 bushels; quality average; quantity and quality of straw average; seed fully 4 bushels. Barley, quantity average, say 38 to 40 bushels; quality barely average; quality of straw not average; quantity over average; seed  $3\frac{1}{2}$  to 4 bushels. Oats, quality about average; quantity average, say 32 bushels; quantity of straw average; quality fair; seed 4 to 5 bushels. *Note.*—March, April, and May were unusually cold months; crops grew very slowly till June. The rainfall of July was excessive, and growth slow; average temperature low. A serious loss of oats was occasioned by a shower of hail on 4th September in part of this district. Harvest began on 26th August, about eight days later than average; weather was very broken, yet the harvest on the whole was considered good. Crop of hay, average; about  $1\frac{1}{2}$  ton; what was cut early was so far easily secured, but what was cut later was secured with difficulty, and quality more or less spoiled; clovers fairly abundant. Meadow-hay, none in this district. Potatoes, disease attacked this crop in the end of August—early of their growth—when they looked very promising; yield irregular; early varieties affected to the extent of 50 to 75 per cent; later varieties escaped in comparison, but growth much stunted, and quality impaired; quantity, say 6 tons. Turnips again below average weight, say 14 tons; crop braided well; almost no second sowing; finger-and-toe very prevalent. Damage a little more by insects, owing to the ravages of the caterpillar among turnips. Not more than usual damage by weeds, save in July from the wet. Pastures—the growth was very slow till June, afterwards quite average. Stock throve not well, owing to wet and cold; no disease. Clip of wool, average.

ROSS-SHIRE (District of Tain, Cromarty, and Invergordon).—Wheat, 4 bushels; quality, not average. Barley, decidedly under average. Oats, full average. Harvest began about the usual time, 26th to 28th August. Hay, over average weight, but not such good quality, owing to wet weather; weight,  $1\frac{1}{2}$  ton. Meadow-hay, none grown. Potatoes, no disease; no quite new varieties planted; 6 to  $6\frac{1}{2}$  tons. When not affected with finger-and-toe, which was very prevalent, weight quite equal to last year; braided very well; no resowing; swedes, 22 to 24 tons; yellows, 19 to 20 tons. Wild mustard worse than usual. Pastures, quite average growth, but not average quality. Stock throve not at all well. Cattle and sheep perfectly free from disease. Clip of wool, quite average quality and quantity.

SUTHERLANDSHIRE.—Wheat, none grown. Barley, localities vary very much; in some the quantity of grain was considerably less than last year, while quality and weight were better; in others, quite up to last year; average, 32 bushels; seed, 4 to 5 bushels. Oats, 36 to 40 bushels; some localities quantity less, in others quite up to 1890; quality of corn and straw better; from 5 to 6 bushels sown; specially favoured with harvest

weather, and crops secured in good condition, but at a greater cost in labour than usual, owing to corn being laid and twisted. Harvest from ten days to a fortnight later. Hay, average from 15 cwt. to 1 ton 6 cwt.; both quantity and quality considerably below last year; damaged by wet weather. Very little meadow-hay grown. Potatoes, a very variable crop;  $3\frac{1}{2}$  to 5 tons; considerably below last year; small and early varieties very much diseased; no new varieties. Turnip crop may be over all characterised as very bad, and in many parts of the county the lightest crop ever grown; swedes average 12 tons, yellows 8 or 9 tons; finger-and-toe bad; braided well; injured by caterpillar after singling. Corn crops not injured by insects, but turnips much damaged by caterpillar, in some places very seriously. The very wet season promoted the growth of weeds; no damage, however, done to corn crops, but amongst turnips some damage done, and more than the usual labour in keeping under. Up to end of June pastures fairly good, but after that ran off rapidly; quality of herbage much below last year. Stock left nothing for the grazing, and in many cases cattle sold at less money in autumn than paid for them in spring. Clip of wool about an average; ewes a little lighter, but eild sheep quite up to last year.

CAITHNESS-SHIRE.—Not a wheat-growing district. Bere, quantity of grain about 32 bushels; quality of grain and straw worse than last year; seed sown, 4 bushels. Oats, quantity of grain less than last year; straw about the same as last; quantity of grain about 30 bushels; quantity of seed sown, 6 bushels after lea, and 5 bushels in turnip land. Harvest, after the usual time, from two to three weeks. Hay, quantity less; quality worse as regards both rye-grass and clover; quantity not calculated. Meadow-hay—on this farm it could not be cut, owing to being flooded with water. Potatoes, the yield was worse than last year; the quantity, 2 tons 18 cwt.; disease, equal to about one-half, began September; variety, Champions (new seed). Turnips are just about half a crop; the weight not ascertained; the crop braided all right, but after being thinned the weather became very wet, and continued so until the crop was all but drowned; exceptionally bad season for turnips. Not aware of any damage by insects. Owing to the wetness of the season, turnips were rather dirty; otherwise weeds were no worse than usual. Pastures—through excessive rain the pastures were not up to the average. Stock thrived not so well as formerly. Wool much the same as usual in quantity and quality.

ORKNEY.—Wheat, none—not much grown; bere, seed  $3\frac{1}{2}$  to  $4\frac{1}{2}$  bushels; average crop, 28 bushels 47 lb.; about 8 bushels less than last year. Oats, seed, 4 to 6 bushels; average crop, 24 bushels 38 lb., being 6 bushels less than last year; there was a fair average bulk of straw; owing to the wet cold autumn oats were long in ripening, and ripened very irregularly, consequently a good deal was cut with a green shade. Harvest began towards the end of September, being about a fortnight after the usual time. Hay was a light crop, little above half the quantity of last year, the average being about 17 cwt.; the quality was not extra, as, owing to the wet weather, a good deal of it lay bleaching for weeks before it was secured. There is only some coarse stuff grown on wet meadows. Potatoes a miserable crop, diseased and small, not half the quantity of last year; average about 2 tons; the crop could not grow owing to the cold wet weather, and in many cases where the land was wet it was entirely destroyed. The turnip crop braided well and came quickly to the hoe, but the excessively wet cold season checked growth, and on wet land there was little or no crop; finger-and-toe also injured the crop on poor shallow soils; there is, however, a fair crop on good, deep, dry land; the average crop is 6 tons, being only about half the quantity of last year. Little or no damage by insects.

Weeds flourished, and, owing to the constant wet, the land was seldom in a state to scarify. Pastures were very good in the month of July, but, owing to the cold and extremely wet weather, they were very bare in the autumn. Stock thrived fairly well while grass was good, but latterly the weather was too wet and cold, and pastures too bare. There was some disease among cattle, caused by the cold, wet, changeable nature of the season. Clip of wool, average.

**SHETLAND (Island of Unst).**—No wheat grown in this island. No barley grown. Bere was a fair average crop; unable to state quantity; seed about 3 to 4 bushels; mostly small patches by crofters. Oats about 24 bushels; the crop was an average one, but before it was secured, in many cases, it was much wasted by gales of wind and rain, so that not more than three-fourths of an average crop was secured. Harvest about two weeks after usual time. Hay, cannot say weight; the quantity and quality were about the same as last year. Clover, in some cases much under an average. Meadow-hay, about the same. Potatoes, yield not more than three-fourths of last year, and more than one-third of that yield useless by the old disease, and in some cases by wet rot; no new varieties planted. Almost all the crofters will require to import seed. Turnips, cannot say weight, but the crop was a very poor one: the crop braided well, and for some time looked well, but more than one-half the crop went to finger-and-toe, and in some cases whole fields were useless. Injury by insects, only the turnip crop, damage greater than usual. No damage by weeds. Pastures during the season of average growth and quality with last year. Stock thrived well, and were free from disease. Clip of wool, a fair average.

**SHETLAND (District of Lerwick).**—Wheat, none. Barley, grain and straw both inferior to last year in quantity and quality, caused by wet season. Oats, grain and straw both inferior to last year in quantity and quality. Harvest about two weeks after the usual time. Hay, quantity and quality both inferior to last year as regards rye-grass; clover a fair average, and equal to last year. Meadow-hay, crop inferior and not so good as last year. Potatoes, not so good as last year in quantity; potato disease very general over the district; commenced about 1st August, and in many cases spoilt the whole crop; no new varieties planted. Turnips not equal to last year in quantity or quality, and generally inferior; crop braided well, and only one sowing. No insects. Owing to damp season chickweed was very abundant, and damaged the turnip crop more than usual. Pastures a good average. Stock thrived fairly well. No disease. Clip of wool—the quality was good, and the quantity a fairly good average.

## THE METEOROLOGY OF 1891.

The following table gives a comparison of the winds and sunshine of 1891 with the averages of previous years:—

TABLE SHOWING FOR WIND DIRECTION AND FORCE, AND FOR SUNSHINE, THE EXCESS ABOVE, OR THE DEFECT FROM, THE AVERAGES OF PREVIOUS YEARS.

1891.	DIRECTION OF WIND—DAYS.									Force.	Hours of Sunshine.
	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.		
January . .	1	-1	0	-1	0	0	1	0	0	lb. p. sq. ft. 0.32	- 8
February . .	-1	-2	-1	-2	1	2	2	-1	2	- 0.51	5
March . . .	2	1	-1	-1	-2	-2	0	2	1	1.27	- 5
April . . .	-1	1	4	1	-1	-2	-2	0	0	0.09	- 4
May . . . .	3	2	1	0	-1	-3	-2	0	0	0.49	-23
June . . . .	0	3	3	0	-1	-2	-2	-1	0	0.39	-21
July . . . .	2	1	-1	0	0	-2	-1	2	-1	0.23	-55
August . . .	0	1	0	0	0	-1	1	0	-1	0.10	-52
September .	-1	-1	0	-1	1	1	-1	-1	1	0.89	-30
October . .	-1	-1	0	1	2	1	-1	-2	1	0.35	6
November .	-1	0	1	0	1	0	-1	-1	1	-0.35	-29
December .	-1	-1	-1	-1	1	1	1	0	1	0.54	-13
Year . . .	2	3	5	-4	1	-7	-3	-2	5	0.32	-229

There was thus a prevalence of northerly and easterly winds and calms, and a diminution of westerly winds, principally in April, May, and June. Temperature on the mean of the year was a little above the average at western stations, from the Mull of Kintyre northwards to Shetland. The greatest excess was in the extreme north, where it amounted to half a degree. In eastern districts the year was colder than usual—the deficiency being nearly a degree on the east coast from Kinnaird Head southward to the Tweed, and thence across by the Cheviots to the shores of the Solway. To the south of the Forth, and to the east of the Clyde and the Nith, the rainfall was above the annual average, the excess on the upper Tweed being ten per cent; and to the north-west of a line drawn from Braemar to Oban, and thence at western stations northwards to Shetland, it was also above the average of the year. At the Ben Nevis Observatory the excess was 24 per cent, the amount for the year there being 178.74 inches. In all other districts the rainfall was less than the average. The greatest deficiency

was in south-western districts; in eastern districts from Fife to Buchanness; and in the east from Inverness to Kirkwall, the deficiency over these districts generally being from 10 to 20 per cent. There was the very large deficiency of 229 hours of sunshine during the year, being indeed under the average in all months except February and October, when it was slightly above it. In the two important months agriculturally—July and August—the deficiency was very serious.

JANUARY.—The mean temperature of the month was  $36^{\circ}.1$ , or  $1^{\circ}.1$  under the average, the days being  $0^{\circ}.7$  and the nights  $1^{\circ}.5$  colder than usual. The great deficiency occurred to the east of a line drawn from Ayr to Aberdeen, being from  $2^{\circ}.0$  to  $3^{\circ}.0$  in many localities. On the other hand, in the north-west of Scotland it was the average, and over a considerable extent even slightly above it.

The rainfall was 2.67 inches, or 1.34 inch less than the average. Except at Fort Augustus, Scourie, and Cape Wrath, it was everywhere under the average, the greatest deficiency being to the south of the Grampians, only from a fourth to a half of the usual January rainfall being collected at many stations. It may also be noted it was only the average or but little under it at Gordon Castle, Grantown, Dalnaspidal, Fort William, Glenquoich, Glencarron, Stourhead, Stornoway, and Lairg—in other words, in the districts immediately surrounding those places at which more than the average fell.

FEBRUARY.—The mean temperature was  $41^{\circ}.6$ , or  $3^{\circ}.3$  above the mean, the days being  $5^{\circ}.3$  and the nights  $1^{\circ}.3$  above the average. The unusually high temperature of the days as compared with the nights was one of the most striking features of the weather of this remarkable month. It will be seen from the above table that south-westerly winds were much above the average. The excess of high temperature was greatest from Strathspey westward to Cape Wrath, and south-westward to Ardnamurchan, the excess being  $6^{\circ}.0$  at Covesea,  $5^{\circ}.8$  at Glencarron, and  $5^{\circ}.6$  at Gordon Castle. This was the warmest February that has occurred in the north-east of Scotland since 1796, the February of that year being  $7^{\circ}.1$  above the average. Since 1764 the February of 1891 was the second warmest recorded. The mean barometer for the month was also well-nigh unprecedentedly high. As usual in such cases, the temperature of high-level stations was relatively higher than that at lower levels. Thus, at the Ben Nevis Observatory, temperature was  $7^{\circ}.5$  above the average for the month there, whereas at Fort William it was only  $4^{\circ}.3$ .

The rainfall was 1.26 inch, or 1.77 inch less than the average. On the mainland, to the north of a line drawn from Inverness to Portree, the rainfall was above the average, the

excess being 45 per cent between the Cromarty and Dornoch Firths. Everywhere else the rainfall was under the average, and south of the Grampians very greatly so, the deficiency being over this wide district from 70 to 95 per cent.

MARCH.—The mean temperature was  $37^{\circ}.0$ , or  $2^{\circ}.5$  under the average, the days being  $1^{\circ}.7$ , and the nights  $3^{\circ}.3$  colder than the average. The temperature of March was thus the reverse of that of February. This defect of temperature was distributed very equally over the whole country, with the usual winter difference of being greater in strictly inland situations, and less on the coasts and islands.

The rainfall was 3.38 inches, or 0.50 inch above the average. In the north-west, over the north and south slopes of the Grampians, and over south-western districts, the rainfall was under the average, the deficiency, however, scarce anywhere exceeding 30 per cent. In all other parts of the country, it was above the average, notably so between the Tweed and the Firth of Forth, where over wide districts more than double the usual rainfall of March was collected.

APRIL.—The mean temperature was  $41^{\circ}.3$ , or  $2^{\circ}.8$  under the average, the days being  $2^{\circ}.3$ , and the nights  $3^{\circ}.3$  colder than usual. The greatest defect of the temperature was at southern and the least at northern stations, the differences between these two parts of the country being very great. From the Tweed to the Mull of Galloway, temperature was about  $4^{\circ}.0$  under the average, from which it steadily diminished in advancing northward, till in Shetland it was only half a degree under the average. Barometric pressure being considerably higher in Shetland than on the Solway, an unusual prevalence of easterly winds resulted, under whose influence low temperatures ruled.

The rainfall was 1.20 inch, or 1.03 inch less than the average. The rainfall was a little above the average at Cally, Ardwel House, and the Mull of Galloway, but except these stations in the extreme south-west, and at Perth, the rainfall was everywhere under the average. The deficiency was greatest, from 70 to 90 per cent, at inland places south of the Grampians, and in all districts to the north of this range.

MAY.—The mean temperature of the month was  $46^{\circ}.8$ , or  $2^{\circ}.2$  under the average, the days being  $1^{\circ}.8$  and the nights  $2^{\circ}.5$  colder than usual. The greatest deficiency of temperature,  $3^{\circ}.0$ , occurred along lower Tweeddale, from which, as in the previous month, it diminished in proceeding northward, till in Shetland it was only a degree under the average. Again, barometric pressure was higher in the north than in the south, with the result that cold north-easterly winds prevailed six days more than the average.

The rainfall was 2.28 inches, which is the average fall of the

month. It was, however, very irregularly distributed, being above the average to the north of a line drawn from Aberdeen to Harris in Lewis, the excess being 105 per cent at Bressay, 70 per cent in Hoy, 82 per cent at Gordon Castle, and 62 per cent at Cromarty; it was also above the average over eastern districts for some distance inland, and in detached districts in the south-west. On the other hand, the rainfall was under the average over a broad district on each side of a line drawn from Monach, through Oban and Paisley, to Dumfries.

JUNE.—The mean temperature was  $55^{\circ}.6$ , or  $0^{\circ}.9$  above the average, the excess being wholly due to the greater heat of the days, which was  $1^{\circ}.7$  above the mean of the month. The distribution of temperature was very unequal. It was under the average to the east and north of a line drawn from Hawick, through Edinburgh, Arbroath, New Pitsligo, Gordon Castle, Dunrobin, and Scourie. The greatest deficiency,  $1^{\circ}.5$ , occurred in Lower Tweeddale, at the Bell Rock, and North Unst. Elsewhere, temperature was above the average, the excess being about  $3^{\circ}.0$  in western districts from Skye to Rothesay.

The rainfall was 1.14 inch, or 1.39 inch less than the average. It exceeded the average a very little from Dunnet Head to Kirkwall, and at Bressay; but everywhere else it was under the average, the deficiency being greatest, from 70 to 85 per cent, to the east of a line drawn through Forres, Perth, Dollar, Edinburgh, and Milne Graden.

Pressure was still higher in the north than in the south, and the consequent prevalence of east winds brought low temperatures and more clouded skies over the more strictly eastern districts; but inland, and over the west, skies were clearer, the sunshine stronger, and temperature higher.

JULY.—The mean temperature was  $57^{\circ}.3$ , which is the average of July, the temperature of the days and nights being also normal. In Shetland, and to the east of a line drawn through Aberdeen, Braemar, Rothesay, Dumfries, Bowhill, and Marchmont, temperature was above the average: the excess, however, nowhere exceeded  $1^{\circ}.3$ . Elsewhere it was under the average, the greatest deficiency, one degree, being from Peterhead round the coast of the Moray Firth to the Pentland Firth; and also on the south-west coasts, from the Mull of Kintyre to the Isle of Man.

The rainfall was 2.87, or 0.29 inch less than the average. It was above the average to the north of a line drawn through Aberdeen, Braemar, Fort Augustus, and Stourhead. It was also above the average, slightly, at Bowhill and the eastern part of the Lothians. More than double the average was recorded on the coast of the Moray Firth from Banff to Forres, the excess at Gordon Castle being 166 per cent; while



the rainfall was more than three times the average in Shetland, nearly double the average in Orkney, and 152 per cent in excess at Dunnet Head, and 125 per cent at Holborn Head. Elsewhere the rainfall was under the average, the deficiency being great, from 70 to 90 per cent at many places to the west of a line drawn through Monach, Roshven, Dumbarton, Drumlarnig, and Dumfries. The contrast of a 90 per cent deficiency at Turnberry Castle with an excess of 225 per cent at Sumburgh, is very striking, and of rare occurrence.

AUGUST.—The mean temperature was  $55^{\circ}.6$ , or  $1^{\circ}.0$  under the average, the days being  $1^{\circ}.6$  and the nights  $0^{\circ}.5$  colder than usual. Except in western Perthshire and the lower Clyde, where temperature was a very little above the average, it was everywhere under the average. The deficiency was in all inland districts, but greatest round the coasts, where generally it was fully a degree and a half colder than usual in August.

The rainfall was 5.51 inches, or 2.06 inches above the average. At Culloden, Cawdor, and Forres it was about 10 per cent under the average; but above it in all other districts, in many places very largely so. The excess in percentages above the average was 162 at Benquhat, 156 at Ewes, 145 at Cally, 130 at Cargen, 127 at Dunnet Head, 123 at Corsewall, 103 at Pinmore and Lednathie, and 100 at Cape Wrath and Dumfries. Indeed, if we except the south shores of the Moray Firth and the outer Hebrides, the weather of August was peculiarly wet, cold, and backward all over Scotland.

SEPTEMBER.—The mean temperature was  $54^{\circ}.8$ , or  $1^{\circ}.5$  above the average, the excess being equally divided between the days and the nights. The excess of temperature was equally distributed over the whole country.

The rainfall was 5.16 inches, or 1.54 inch above the average. Its distribution over the country was extremely irregular. On the shores of the Moray Firth, from Fraserburgh to Orkney and for thirty miles inland, the rainfall was from 30 to 50 per cent under the average. It was also under the average at places in the extreme south-west; in eastern Perthshire and in the western Hebrides. In other parts of the country it was above the average—in many cases largely so; and during the great storm of the 20th–21st the rains were unprecedentedly heavy, and very great damage was done to the crops, railway stock, &c., in those localities where the heavy rains occurred. More than double the average of the month was collected at Glenquoich, Corran, Douglas Castle, Stobo, Langhaugh, Milne Graden, Fettercairn, Montrose, and Bressay. In several places in the counties of Kincardine, Forfar, Edinburgh, Haddington, and Berwick, 4.0 inches and upwards fell during the two days of the storm of the 20th–21st.

OCTOBER.—The mean temperature was  $46^{\circ}.7$ , which is the October average; the days and nights being also the average. In Shetland and Orkney, temperature was fully two and a half degrees above the mean, but from half a degree to a degree under the mean over that half of Scotland to the east of a line drawn from Inverness to the Mull of Galloway, the greatest deficiency being in Galloway and Ayr, amounting in some districts to  $1^{\circ}.3$ .

The rainfall was 4.31 inches, or 0.30 inch above the average. It was under the average to the north of a line drawn through Montrose, Ballater, Fort William, and the Butt of Lewis; the greatest deficiency, about three-fourths of the average, being along the Moray Firth from Dunrobin to Gordon Castle. It was also under the average within the curved line passing through Jedburgh, Paisley, Helensburgh, and thence round by Perth to the Isle of May, the deficiency being generally small, the largest being 47 per cent at Marchmont.

NOVEMBER.—The mean temperature was  $40^{\circ}.5$ , which is the average of November, the days and nights being also the average. Again the temperature of the Northern Islands was  $2^{\circ}.5$  above the average; it was about a third of a degree on the east coast from Buchanness to the Tweed; and on the west coast, from the Mull of Kintyre to Cape Wrath, the excess was about a degree in many places. Elsewhere, temperature was under the average, the greatest deficiency being fully a degree in the south.

The rainfall was 3.72 inches, or 0.12 inch less than the average. The rainfall was above the average in the east between the Dee and the Tay, and at the south-western stations from Dumfries to Islay, the excess, however, being in no case large. Elsewhere, it was less than the average, the deficiency scarcely exceeding a third, except in Orkney, where it was nearly a half.

DECEMBER.—The mean temperature was  $38^{\circ}.5$ , or  $0^{\circ}.7$  above the average, the days being  $1^{\circ}.0$ , and the nights  $0^{\circ}.3$  warmer than usual. Temperature was above the average, except in the counties of Orkney, Caithness, Sutherland, Aberdeen, Kincardine, and in Lower Tweeddale, the deficiency being greatest ( $1^{\circ}.3$ ) at Lairg. The greatest excess, about a degree and a half, was to westward of a line passing from Dumfries to Oban.

The rainfall was 5.80 inches, or 1.84 inch above the average. Singularly enough, the distribution of the rainfall exactly corresponded with that of the temperature: where temperature was above the average, so was the rainfall; and where under it, so was the rainfall, with the single exception of the rainfall of the Lower Tweed, which was about a half above the mean. The greatest excess was along the valleys of the

Forth and Clyde, where at several places it nearly doubled the average, and the greatest deficiency in Aberdeenshire, where it was only about half the average.

The harvest of 1891 was from a week to a fortnight earlier than usual between the Solway and the Firth of Clyde; about the average between the Clyde and Tweed on the south to the Don on the north; and elsewhere later than the average, the latest districts being the extreme north, where harvest was fully a fortnight late. The distribution of temperature in June and July, and the almost unprecedentedly heavy rainfall in the north in July, explain these differences.

The wheat crop was the average, or slightly over it, south of the Grampians, but under it to the north. Barley was generally a full average over the districts bounded by a line drawn through Forfar, Dumbarton, Ayr, and Berwick; but less than the average in Galloway, and in almost every district north of the Grampians. The oat crop was very irregular, being a full average in only a few districts; but a deficient crop, as regards returns, in the great majority of instances to the south of a line drawn from Peterhead to Fort William, being greatly damaged by the wet weather and heavy rains of August and two subsequent months.

The potato crop was under the average nearly everywhere between the Tweed and the Firth of Forth, and also to the north of a line drawn from Gairloch to Montrose. The crop in the counties of Aberdeen, Banff, Caithness, Orkney, and Shetland was markedly deficient, the tubers in a number of districts being small and imperfectly matured. In other parts of the country the crop was a full average, and, besides, in these districts, disease spread less extensively and severely than in the districts where the crop was deficient.

Turnips were a particularly poor crop in the counties of Aberdeen, Banff, Nairn, Sutherland, Caithness, Orkney, and Shetland; and under the average in other parts, except the Lothians, Berwick, Galloway, Ayr, Clydesdale, Dumbarton, Bute, and Argyll.

## THE CULTIVATION AND MARKETING OF STRAWBERRIES IN CLYDESDALE.

By JAMES BARR, junior, Whiteshaw, Carluke.

## HISTORY OF THE PLANT.

THE strawberry belongs to the genus *Fragaria*. The common wood strawberry (*Fragaria vesca*) is found growing wild in the woods and hedges all along the Clyde valley, and in many other parts of Scotland. This wild native plant was the only one in cultivation during last century, when *Fragaria virginiana* was introduced from America.

Strawberries were known to the Romans in the time of Pliny, but the climate of Italy appears to have been too hot for their cultivation. They are said to have been grown in the Bishop of Ely's garden in Holborn in the year 1483.

M. H. de Vilmorin in 'Les Plantes Potagères' adopts the following classification :—

1. *F. vesca* (the Wood Strawberry).
2. *F. alpina* (the Alpine Strawberry).
3. *F. elatior* (the Hautbois).
4. *F. virginiana* (the Scarlet Strawberry).
5. *F. chiloensis* (the Chili Strawberry).
6. *F. grandiflora* (the Pine or Carolina).

From these six species all the varieties of strawberries grown at the present day have had their origin, and have all been introduced to notice during the present century.

Mr A. F. Barron, superintendent of the Royal Horticultural Society's Gardens at Chiswick, in an article in the Society's Journal, October 1889, gives the following as the leading eight varieties :—

1. *Keens' Seedling*.—Raised by Mr Keens, market-gardener, Isleworth, 1821. This variety, when exhibited before the Horticultural Society in 1821, created quite a sensation, so greatly was it in advance of all others.

2. *British Queen*.—Raised by Mr Myatt, market-gardener, Deptford, about 1840. The grandest strawberry ever introduced.

3. *Vicomtesse Hericart de Thury*.—Raised by M. Jamin of Bourg la Reine, Paris, and introduced into this country about 1850. A favourite early variety.

4. *Elton Pine*.—Raised by Mr T. A. Knight, a former President of the Horticultural Society. An excellent late sort.

5. *Sir Joseph Paxton*.—Raised by Mr Bradley, of Southwell, Notts. The leading London market strawberry.

6. *President*.—Raised by Mr Green, of High Cross, Ware. Large and excellent.

7. *Sir Charles Napier*.—Raised by Mr Smith, market-gardener, Twickenham. A favourite market sort.

8. *Noble*.—Raised by Mr Laxton of Bedford, and certificated by the Royal Horticultural Society in 1887. The earliest strawberry, and withal one of the noblest ever introduced.<sup>1</sup>

Of the early varieties, the Vicomtesse Hericart de Thury is the one most extensively cultivated in the Clyde district. It suits the soil and climate, and is an enormous cropper. The fruit is of very fine flavour, a bright attractive colour, and possesses the great advantage of being firm and standing the railway journey well. *Sir Joseph Paxton* and *President* are also grown to a small extent, but are liable to rot on the ground, and are not so profitable. *Elton Pine* is the only late variety grown in the Clyde valley, and in an early year, when it ripens well, yields very large returns per acre. It only ripens safely in the warm sheltered fields of the valley. In a late season it comes in competition with cherries and other fruits, and consumers being fond of a change, prices often drop to a very low level. But for preserving, if the make has been small, prices will sometimes rise to the highest of the season.

The writer and a few others have tried Laxton's *Noble*, but it is not yet grown to any large extent.

#### THE HOME OF THE PLANT IN SCOTLAND.

The valley of the Clyde has been long famed for the quality and flavour of its fruit. Previous to the importation of Canadian and American apples, the industry of fruit-growing was a very prosperous one, and yielded considerable revenues both to the proprietors and fruit-dealers. One orchard of 25 acres of large fruit, belonging to Cambusnethan Castle, yielded a sum of £1000 per annum. Dr Waugh's orchard of 6 acres of the best small fruits, and one of the best situated and attended on the Clyde, produced recently £300 per annum, the purchaser doing all the labour of pulling and marketing. The fruit district may be said to extend from Bothwell to Lanark, a distance of nearly twenty miles. It possesses advantages for fruit-growing not surpassed by anything in Scotland. The Clyde at Garrion Bridge, which is seven miles above Hamilton and eighteen miles above Glasgow, is only 100 feet above sea-level, and at Crossfield, four miles higher up, it is

<sup>1</sup> I am indebted to Mr A. F. Barron for much of the foregoing history of the plant.

150 feet, and at the foot of Stonebyres Falls it will not exceed 180 feet. The valley runs north-west and south-east, and the ground rises on both sides with a moderate slope, to 500 and 600 feet above sea-level. This secures protection from the east winds, which in the early spring are so destructive to the fruit-blossom. At this season of the year, when the fruit-trees are in full blossom, a drive along the Clyde road from Garrion Bridge to Lanark is most enchanting. Strawberry-beds are to be seen on both sides of the river, clothing the steep hillsides and interspersed with orchards of Victoria plums, apples, pears, gooseberries and currants, though black currants have been nearly banished from the valley by the disease known as the button.

The scenery is also beautified with noble residences. There is Mauldslie Castle, the seat of Sir William Hozier, Bart., in a park studded with magnificent trees, planted by the late Earl of Hyndford, who was the pioneer in the Upper Ward of Lanarkshire in planting woods on his estates, which has done so much in ameliorating the climate.

Next comes Milton-Lockhart, the site of which was selected by Sir Walter Scott—his son-in-law, John Gibson Lockhart, being the half-brother of the proprietor. There was the workshop of John Greenshields the self-taught sculptor, the statue of Sir Walter, now in the Advocates' Library in Edinburgh, being the work of his hands.

Several kinds of plums seem to be indigenous to this particular spot, as they grow and thrive in the hedges along the sides of the road, often producing large crops without cultivation.

Further on is the Nethan Glen and Craignethan Castle—the Tillietudlem of 'Old Mortality'—the haugh next the river, the site of the wappenshaw, and exploits of Goose Gibbie, being now all covered with strawberry-plantations.

We are now arrived at the village of Crossford, most charmingly situated, surrounded on the hillsides by orchards, bearing all kinds of fruit, and the view of the surrounding scenery, when the fruit-blossom is at its fullest, is a sight never to be forgotten.

Within the circumference of a few miles from Crossford, the largest amount of strawberries in Scotland is produced. Braidwood Station, from which the larger part of the strawberries grown in this particular area are sent, despatched in 1891, 877 tons 18 cwt.

Across the river is Carfin, the delightful seat of James Noble Graham, on whose lands a large area of strawberries are grown.

As we ascend the valley, the hillsides sloping to the river are all planted with strawberries, one field, particularly well sheltered, producing three years ago 4 tons of strawberries per acre, which at £25 per ton was equal to the fee-simple of the land.

Passing through Hazelbank village, we are still in the midst of strawberry-plantations and fruit-cultivation of all kinds. The noise of Stonebyres Fall is heard, and the finely-wooded estate of Stonebyres, through which we pass, imparts variety to the scene. The village of Kirkfieldbank follows, from which the first strawberries were sent to Kent Street Market, Glasgow, over thirty years ago.

On the opposite side of the river the Nemphlar braes are clad with strawberry-beds, the farmers there being very successful growers, and the plantations continue all the way up to the town of Lanark.

### SOIL AND CLIMATE.

The strawberry is a very hardy plant, and will grow on all soils, except on damp peaty land, on which it does no good, but is dwarfed and stunted. On light sandy or gravelly soil it is not advisable to grow to any large extent, as in a dry season the plants become burned up, and the crop in any year is not a productive one. On some strong heavy clays they thrive well, and in a year of sunshine, firm, well-flavoured fruit is got from these soils. Deep, rich, free-working loamy soil is best suited for the strawberry. On the rich alluvial soils of the Clyde valley the plant grows to perfection: two plants of one year's growth were exhibited at Carluke Farmers' Club, by Mr John Shirlaw, of Howgate, showing roots 3 and 4 feet in length, and with an immense amount of fibre. The plants in such land are also furnished with leaves of great luxuriance, the whole bed is completely covered, affording great protection to the fruit from a hot scorching sun, keeping the land clean and free from weeds. In a rainy season, however, such as we had in the year 1890, the great luxuriance tends all the other way, and a large part of the fruit rots on the ground. Whatever the nature of the soil, it is absolutely necessary that it be thoroughly well drained, the drains being 3 feet 6 inches or 4 feet deep; for if the subsoil is suitable, the roots of the strawberry-plant will penetrate 3 or 4 feet below the surface. The fruit growing and ripening on the ground makes it all the more necessary to have the surface dry.

Strawberries will thrive and grow in a wide range of climate. They produce good crops, and are profitable, under favourable conditions, on the sea-coast, and they have been grown successfully for the market as high as 650 feet above sea-level. At this elevation, however, the crop has many difficulties to contend with: the early spring frosts often destroy a considerable portion of the blossom, and the fruit is also ten to twelve days later in ripening compared with the earlier and more sheltered

situations. For fine table-fruit 6d. per lb. may be got for the first consignments, and by the time the later sort is ready for the market, the price may have fallen to 3d. per lb. and even lower. The strawberry is naturally a sun plant, delighting and revelling in sunshine, and hence it is of the first importance that the ground selected should slope towards the south, south-east, or south-west. Consideration should also be given to secure shelter from the prevailing winds, which in this part of the country are the east and the west. It might be supposed that a plant growing so close to the ground would not suffer greatly from high winds, but a storm occurring in the end of May or beginning of June, when the blossom is in a particular stage, will often destroy one-third of the crop: as happened on the last day of May 1890, a sharp frost destroyed one-half of the blossom; but it is not often that the frost is so intense so late in the year. Profitable cultivation is greatly under the influence of the rainfall of the district. The average fall of the Clyde valley is about 36 inches per annum, and in the year 1890, which was a sunless wet summer, many growers did not receive as much for the fruit as paid the labour-bill. To plant to any large extent when the rainfall exceeded 45 inches would risk years of occasional failure, and the labour-bill for cleaning would be considerably higher.

Some growers attach greater importance to situation and shelter than to soil. Hence all along the Clyde valley the sloping hillsides are covered with strawberry-plants. Some of the beds are planted on ground so steep that all the labour has to be performed with the spade. A field sloping gradually to the south, well sheltered from the east and west winds, situated at an elevation of 200 feet, will in a favourable year produce 4 tons of fruit per acre, when another field, receiving similar treatment as to manure and labour, but situated at an elevation of over 600 feet, with a cold exposure, and having no shelter from high winds, will not produce over 2 tons of fruit per acre.

#### PREPARATION OF THE GROUND.

##### *Manuring and Planting.*

It is of primary importance that before planting the ground should be entirely free of weeds of all kinds. If couch-grass or chickweed get established in a strawberry-plantation, they are a yearly source of extra labour and loss of crop during the whole existence of the plants. Preference is always given to a field of old pasture, and for such land, when well situated as to exposure and shelter, growers will pay as high as £8 to £10 per acre, considering it is more profitable to do so than plant on high cold land at £1 per acre. When a field of lea is

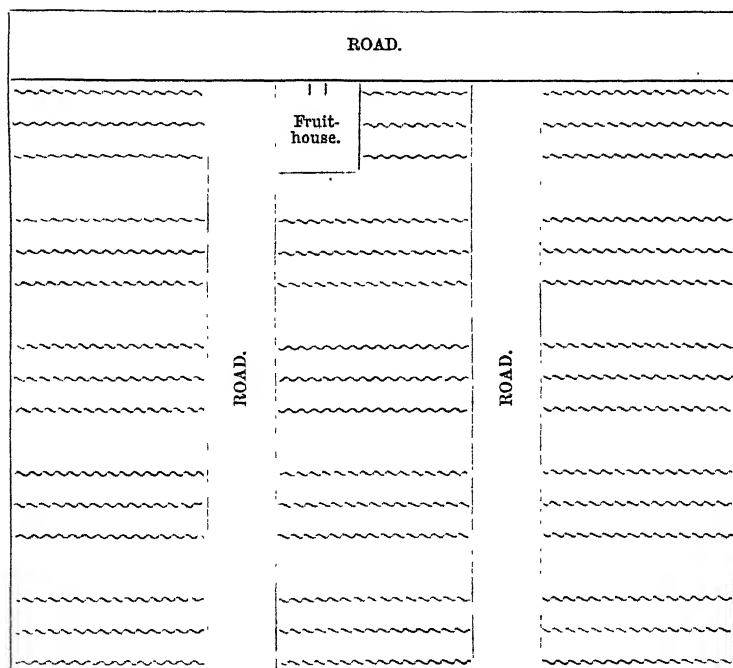


selected, the most approved method is to trench the land about 2 feet deep. This work should be started in November or December for spring planting, and when properly executed will cost from £7 to £8 per acre. Such land produces a more regular and more abundant crop during the whole years of cultivation than land which has been under a regular rotation of cereal cropping. It would do so with cereals, and much more so with strawberries. When the field selected is in stubble, the best results have followed from taking a crop of Champion potatoes, when the soil is suitable, manuring heavily, so that the crop shall completely cover the ground, the great object being to thoroughly clean the land from all weeds of every kind. Good results have also followed a crop of yellow turnips, but it is sometimes difficult to cover the ground with this crop in the same manner as with potatoes. The success of strawberry cultivation depends to a large extent on manuring, and experienced growers spare no expense on this most necessary part of the work. Sixty tons of the best stable manure per acre, which when laid down in the field has often cost over 7s. 6d. per ton, equal to £22, 10s. per acre, is a large outlay for a crop which yields no return the first year; but it has been found more profitable in the end to apply this quantity than to try with twenty or thirty tons. When the land is trenched the manure is put below the top spading, the surface being levelled as the work proceeds, and the land is then ready for planting. When a crop of potatoes or turnips has been taken from stubble-land, the manure to the extent of 50 to 60 tons per acre is carted on to the field when dry enough for such work. Some growers cover the manure with the plough, but it has been found more profitable, though more costly, to point in with the spade.

In addition to the stable manure applied, those wishing to secure an abundant crop apply bone-meal on the top of the manure at the rate of 2 cwt. per acre. Trials have been made of applying one-half, or 30 tons of manure, at the time of planting, and applying the remainder as a top-dressing at the rate of about ten tons every second year. This course has much to recommend it when it can be done, but it is not always followed, and where the land is steep it is often very difficult and expensive to carry out. Sometimes the bone-meal, instead of being put in with the manure, is applied as a top-dressing to the young plants in the autumn of their first year. The application of artificial manure to the strawberry crop is a somewhat risky one. If the season should be one favourable to luxuriant foliage, when a nitrogenous manure has been applied in the early spring it is productive of very serious damage and loss of crop. Bone-meal may be freely

used with all safety, and a top-dressing of from 5 to 10 cwt. per acre may be profitably applied every year or second year, and this is done by many growers. The land may now be supposed to be ready for planting, and where the field has been lea, great vigilance is required to overcome the ravages of the grub. It is no unusual thing to have to replant two or even three times, the heart of the plants being completely eaten up.

To lay off a strawberry-field requires considerable science and skill. It should be divided into plots of 50 to 60 yards in length, less or more according to the size of the field. A road



A STRAWBERRY-FIELD.

3 to 4 feet wide should divide plot from plot. There should also be roads at each end—these all being for carrying the baskets of fruit to the fruit-house. This is a wooden erection put up in the most convenient part of the field to weigh and pack the fruit, and to load it into vans. Where the land has a slope, the beds are made to run in the direction which will secure the earliest and best rays of the sun. The beds should be 28 to 30 inches wide; then a road of the same width between each bed; three rows of plants in the bed, the distance between

each plant being 12 to 15 inches. Where the foliage grows strong and luxuriant the wider distance should be adopted, and on high and more exposed land the narrower distance, so that the ground may be well covered.

Experiments have been made by planting in single rows instead of three, but they were not successful, and of all the methods tried the three rows are much superior. Great care is required to test the variety of strawberry best suited to the soil and climate, and also that the plants are pure and true to name. It is also necessary that the runners should be taken off first year's plants, as those taken from second and third year's plants have been found to produce much smaller crops. The varieties that have succeeded best in the Clyde valley are Vicomtesse Hericart de Thury of the early variety, and Elton Pine of the late variety. President is also grown in some localities, and produces handsome fruit for table, but it does not stand rainy weather. Vicomtesse Hericart de Thury is a large cropper, and produces fruit of very fine flavour and colour. It grows a firmer fruit than most varieties, and is prized on this account for standing the railway journey with less damage than the softer qualities. The Elton Pine is the best of all the late varieties, and in a favourable season produces very heavy crops. It is only suitable for early, well-sheltered situations, and if planted at over 300 or 400 feet of elevation, the risk of loss is too great to encourage planting a large area. Planting cannot be started too early in the spring, as soon as the ground is dry enough for the operation. It is better to risk a little damage from spring frosts than delay the work and risk damage from dry weather. Experiments have been tried with autumn planting, but the loss from winter frosts throwing out the young plants, and the extra expense in cleaning, is so great that it has been abandoned. It is considered that planting with the spade, after the manner of planting young trees, gives the roots of the young plants a quicker start, and for a small area this method may be adopted, but for planting several acres there is nothing like the dibble, and the work is accomplished more rapidly. Women can be trained to do this work, care being taken to see that the roots of the plants are not doubled up nor hung. Particular care should be taken that the plants are properly dressed, and no weak or sickly plants should be used. When plants are purchased, the average price is 5s. per 1000 undressed, and planting at the distances mentioned, it will take about 25,000 plants to the acre. A small extent of land planted the first year, gives runners sufficient to provide plants to extend the plantation, and it is a wise course to plant a certain area of land every year, to take the place of older portions exhausted and put down.

*Labour and Cleaning.*

As soon as the planting is all finished, the labour of keeping clean begins; for if at this early stage weeds are allowed to get the mastery, the plantation will probably never be clean again, and the expense will be largely increased. This work is best done with Dutch hoes, and in the hands of clever active women it becomes one of skill, in which the whole field—plant-beds and roads—are rapidly cleaned of all annual weeds. The hoes work out and in and round about the plants with amazing nicety, and skilled workers who can plant and handle the hoe, and then pull the fruit well, are greatly prized and run after. There are many smart young women who answer to this description, and who are paid good and even high wages. The hoes must be kept going during the whole season, the field being gone over three or four times, or oftener if necessary. This not only keeps the land free of weeds, but stimulates and encourages the growth of the young plants. The great object is to have a vigorous healthy plantation the first season, for if that is not accomplished then, the produce is materially reduced during the whole rotation. As this work proceeds, all blanks, caused by grub or any plants dying, are filled up. All barren plants, which are easily detected by an experienced eye, are rooted out and replaced by fruit-bearing ones. In a wet season the work of keeping down the weeds often becomes very troublesome. Nothing kills chickweed like the sun, but in rainy weather it takes root as fast as it is turned over. For this reason, also, a climate where the rainfall is high is not suitable for strawberry cultivation. No fruit is gathered the first year, the berries are often covered with sand, and the labour exceeds the return. Many growers cut off the blossom and also the runners, if not required for a new plantation, so as to strengthen the young plants. The cultivation of the strawberry on a large scale is practically controlled by the labour market. No class of fruit goes to waste with greater rapidity than the strawberry. Warm, sunny, forcing weather ripens the berries so quickly that unless the staff of pullers are more than above the work, great loss is often sustained. And when this forcing weather is followed by a few days of heavy rain, it is no uncommon occurrence in a large plantation to have tons of fruit destroyed. The valley of the Clyde is well placed for labour, having the towns of Lanark, Carluke, Larkhall, and other smaller villages in immediate proximity; but even with all this, the demand far exceeds the supply. Efforts have been made to import labour from other localities, but have not met with much success. The English custom of the emigrant labour of the hop-pickers has never taken root in Scotland. Some

growers regularly adopt the practice of starting at two or three o'clock in the morning with a fruit-van, driving five or six miles to a neighbouring town, and procure a load of pullers, whom they convey to the field, and then drive them home at night again. The berries begin to ripen the end of June and beginning of July, and continue for five or six weeks, and as the school holidays take place at the same time, nearly all the older scholars, boys and girls, become for the time strawberry-workers. The wages paid to these youths vary according to their ability, and range from 6d. to 1s. 6d. per day, and are paid for overtime. This is a source of considerable revenue to the homes of many working people, and provides clothing and boots for the earnest young workers during winter. This class of workers also find ready employment in the preserve-works, or jam-factories, in topping and tailing gooseberries and currants preparatory to boiling. This is done by piecework, at the rate of 6d. per half-basket, and clever workers can earn from 1s. to 1s. 6d. and even 2s. per day. Strawberry cultivation and the establishment of the preserve-works have within the last ten years been a source of great prosperity to the Clyde district, distributing large sums of money among a class of young workers who could not have taken part in any other occupation. Women are largely, if not quite exclusively, employed for strawberry-plantations—that is, in addition to the boys and girls. Trained women are paid 1s. 8d. per day for cleaning and weeding, and 2s. to 2s. 6d., and in some cases 3s. per day, for the five or six weeks of pulling the fruit. Overtime is also paid for, and a constant good worker has been known to earn as much as £3, 13s. 8d. in one month, in which there would be several idle days from rain and other causes. Less experienced workers are paid according to their ability, which is sometimes the cause of much dissatisfaction. An experienced man is engaged as overseer and timekeeper over each squad of workers, and may have from thirty to fifty under his charge. This class of men are very scarce, and during the height of the season are paid as much as 30s. per week; but he requires to work hard for his money, for the class of workers are difficult to manage.

The work of cleaning divides itself into spring and autumn weeding, the first beginning in March or April, as soon as the ground is dry enough, and continuing until the fruit is ready to pull. The later or autumn cleaning begins as soon as the fruit is all gathered, and consists of cutting away the runners, and clearing the beds of all weeds of every description. Some growers dig the roads between the beds, but many now prefer only to clean the roads, considering that the less the roots are disturbed the better. This work goes on till the end of Septem-

ber, when the labour of the year comes to a close. One year with another, this work of cleaning will average £5 per acre. During the earlier years of the industry, when prices were double what they are now, and when the area under cultivation was perhaps not one-third of what it is now, straw was largely used for the protection of the berries from sand and dirt. This is done by putting straw under the berries on the sides of the roads, and is still practised to a certain extent; for if a grower gets the name of sending to market table-fruit in a sanded condition, it lowers the price of his fruit considerably. From the time the young plants are put into the ground, no part of the labour is done by horse-work, as is the case in England. There the plantations are in single rows, and the plough is run up between them. In Scotland the beds consist of three rows, which give less waste in pulling, and the fruit is not so liable to be sanded.

It is often asserted that farmers do not make successful fruit-growers, but in strawberry cultivation many farmers in the Clyde valley, where the soil and situation were favourable, have reaped rich rewards. At the most critical time of agricultural depression, many were enabled to bring back the tide of prosperity by their strawberry-plantations. A farmer possesses certain advantages, and can save expense in labour by ploughing and carting manure. He may also have good strawberry-land leased at an agricultural rent, and can profitably utilise the ground for other crops when it becomes exhausted as a strawberry-plantation; but as the hay and the strawberry season come on at the same time, it requires a separate staff of workers for the fruit, otherwise either the one or the other is certain to be neglected. The great demand for female labour in the strawberry-plantations and the preserve-works has considerably increased the labour bill to those farmers in the district who have no land suitable for fruit-cultivation. The writer occupies a large holding devoted chiefly to dairy purposes, growing 80 acres of hay per annum, and growing also 5 acres of strawberries. A complete separate staff of workers is kept for the strawberries, while the hay crop is secured by men instead of largely by women, as it used to be ten to fifteen years ago. This strawberry-plantation is 600 feet above sea-level, and comes far short of the plantations of those farmers down in the valley, who, pulling 3 and 4 tons of fruit per acre, can well afford the extra outlay in higher wages for their farm-work.

#### DEVELOPMENT.

##### *Cost and Profit.*

The cultivation of the strawberry in Scotland for the market

is of comparatively recent growth. Thirty-four years ago, Mr James Graham raised strawberries for sale on a sunny bank at the south end of Carluke. Two or three years later, Mr John Munro delivered the first strawberries in Glasgow from Kirkfieldbank. Some years later on, Dr Hunter of Daleville, Carluke, began to grow on a more advanced scale. He packed them in biscuit-boxes, which were carried by a man with a strap over his shoulders. The demand continuing to grow with the supply, the Clyde fruit-growers took it up, and have now brought it to very large proportions. According to the returns of the Board of Agriculture for 1891, the area occupied by small fruit in Scotland is 4627 acres, being an increase of 223 acres over 1890. From available information the area occupied by strawberry-plantations in the Clyde district has now mounted up to 600 acres. The population of Scotland at the last census, 1891, is 4,033,103, which gives 1 acre of small fruit for every 872 of the population. Taking the moderate price of £36 per acre for small fruits of all kinds, we arrive at the large sum of £166,572 as the yearly value of small fruit in Scotland. That is a consumption of 10d. per head of the population, including what is used as fresh fruit, and also what is made into preserves. The population of Glasgow and suburbs at the last census, 1891, was 770,471, and of Lanarkshire 1,045,787, or rather over one-fourth of the whole population of Scotland. The area occupied by strawberries in the Clyde district being 600 acres, and taking this at 2 tons per acre, and £20 per ton, we have the large sum of £24,000 as the yearly value of the strawberry crop. That is a consumption of a little over 5d. per head of the population of Lanarkshire, not a large average sum, when it is considered that some Glasgow families will expend £2 sterling on fresh strawberries during the season. Every acre of strawberries requires an average of three persons to perform the labour. This gives work in the Clyde district to from 1800 to 2000 persons during the season, and as every acre will cost £13 for weeding and cleaning, and pulling and packing, that gives the large sum of £7800 paid in wages, and many years it will exceed that sum. In addition to this, the three preserve-works in Carluke parish will give employment to from 300 to 400 persons during the season, some of them half-timers, and will pay £10,000 to £12,000 in wages; but this sum includes wages for labour on all kinds of fruit preserved, large and small. No fruit yields a quicker return than does the strawberry; though producing no return the first year, it is in full bearing the second year. It is then also that the largest and highest-priced fruit is gathered. This advantage is not always an unmixed good, as the area may be increased too rapidly, either for the consumption or for the labour market. The outlay required for an acre of strawberries

will vary according to the situation and the soil, but the following may be taken as an average:—

## FIRST YEAR.

*Costs per acre.*

One year's rent . . . . .	£5 0 0
60 tons manure and spreading at 7s. 6d. . . . .	22 10 0
Trenching with spade . . . . .	8 0 0
25,000 plants at 5s. . . . .	6 5 0
Dressing plants and planting . . . . .	1 10 0
Weeding and cleaning . . . . .	3 0 0
	<hr/>
	£46 5 0

## SECOND YEAR.

*Costs per acre.*

One year's rent . . . . .	£5 0 0
Weeding and cleaning per acre . . . . .	5 0 0
Pulling and packing 2 tons . . . . .	8 0 0
Marketing, 10 per cent on £40 . . . . .	4 0 0
Railway carriage, 16s. per ton . . . . .	1 12 0
Artificial manure . . . . .	1 10 0
Horse, van, and implements . . . . .	2 0 0
	<hr/>
	£27 2 0
One-fifth proportion of first cost . . . . .	9 5 0
	<hr/>
	£36 7 0

## RETURN.

2 tons fruit at £20 . . . . .	£40 0 0
	<hr/>
Profit per acre . . . . .	3 13 0

Fairly good strawberry-land will produce—

2½ tons per acre at £20 . . . . .	£50 0 0
Cost as before . . . . .	36 7 0
	<hr/>
Profit per acre . . . . .	£13 13 0

## ON HIGHLY FAVOURABLE LAND.

4 tons fruit at £20 per ton . . . . .	£80 0 0
Expenses as before . . . . .	£36 7 0
Pulling and packing 2 tons extra . . . . .	8 0 0
Marketing, 2 tons extra . . . . .	4 0 0
Carriage, do. . . . .	1 12 0
Extra rent . . . . .	3 0 0
	<hr/>
	52 19 0
	<hr/>
Profit per acre . . . . .	£27 1 0



## HIGHLY FAVOURABLE PRICES.

Half ton early fruit, at 6d. per lb.	.	.	£28	0	0
Half ton do. at 4d. „	.	.	18	13	4
2 tons do. at 3d. „	.	.	56	0	0
1 ton do. at 2½d. „	.	.	23	6	8
			<hr/>		
			£126	0	0
Cost as above	.	.	£52	19	0
Extra marketing on £46, at 10 per cent	.	.	4	12	0
			<hr/>		
			57	11	0
Profit per acre	.	.	£68	9	0
			<hr/>		

This large sum per acre will still be made in good seasons, on highly favourable land in the Clyde valley; but it was exceeded in the early years of the industry, when much of the fruit sold at 8d. to 1s. per lb. On reliable authority, £100 per acre of clear profit was realised, after paying costs of all kinds. Some favoured spots of Vicomtesse Hericart de Thury have, in the best year of the rotation, produced at the rate of 6 tons per acre. Elton Pine, which in an early year yields heavy crops in this part of the country, produced at the rate of 7 tons per acre. Enormous as this crop seems, the portion of ground was measured and the crop weighed. Some growers, notably Reid, Hamilton, Dyer, Forrests, and others, possess plantations of 25 to 30 acres, but the larger proportion are only 5 to 10 acres. The existence of a strawberry-plantation may be reckoned at six years, after which it often becomes unprofitable; but on some strong land, where the plants can be manured with stable manure every second year, it may be continued two or three years longer.

## ALLOTMENTS.

Where the surroundings are favourable, the prospect of success for allotments for fruit is much greater than for any other method of farming. The labour required for fruit, and especially for strawberries, is so great, that a man with a young growing family has within himself the element of success. No crop yields a higher return for labour expended upon it than does that of the strawberry, and the work can often be done to as much purpose by boys and girls as by adults. Many youths will perform an equal amount of labour in weeding and pulling the fruit as that done by grown-up persons. The only drawback to a strawberry-allotment would be, that, after six or seven years the crop often becomes unprofitable, and the same ground, if replanted with the strawberry, has so far proved a complete failure. For what number of years the ground may

require a change of cropping is as yet unknown. After repeated trials and failures, fruit-growers who wish to retain the strawberry-plantation as a fruit-plantation, plant raspberry, gooseberry, or red-currant bushes in the strawberry-rows, and at the proper distance, so that when the strawberry crop is run out there is established a profitable plantation of bushes of small fruit in full bearing. This is done according to circumstances, the second or third year after the strawberries are planted.

Mr Houldsworth of Coltness has granted an allotment for strawberries on his estate near Law Junction. The ground was old woodland sloping to the south-west and well sheltered; the elevation being about 500 feet. It consists of  $11\frac{1}{2}$  acres, and is let on a nineteen years' lease to Mr Robert Haddow at a rent of 20s. per acre. The tenant rooted out the old stumps and did all the labour. He also built a comfortable cottage on the land at his own expense. At the end of the lease the proprietor is bound to take over the house at valuation, or to grant the tenant a feu of the ground upon which it is erected, the feu-rent charged being at the rate of 1s. 6d. per pole. The strawberries so far as planted have been quite successful. This example is worthy of being followed, and might be encouraged by proprietors with advantage both to themselves and the tenants, with further security for valuation of fruit-bushes at the end of the lease.

### MARKETING.

#### *Pulling and Packing.*

The strawberry is the finest of all the soft fruits for table purposes.

The flavour is so delicate and delicious, that a dish of newly pulled strawberries accompanied with fine rich cream and a little sugar is a feast fit for the gods.

When the fruit is ripe on the plants, and ready for pulling, the first stage of marketing begins; for if the fruit is carelessly pulled and roughly packed, the market is lost. The produce of certain well-known growers is car-marked, and sells for  $\frac{1}{2}$ d. to 1d. and even 2d. per lb. higher than badly handled fruit. For table-fruit of the highest quality, which is the largest berries in a proper stage of ripeness, pulled in the early morning, and carefully packed, a ransom price is often paid. There is a wholesome rivalry amongst growers to "top the market"; and when it is considered that 1d. per lb. on a crop of 2 tons amounts to £18, 13s. 4d. per acre, it will be seen that there is a remunerative return for care and attention and skill in marketing strawberries of the highest quality. And nowhere in

Scotland is to be found a race of men more worthy of success than the Clyde fruit-growers. Their forefathers being for generations in the trade before them, they have extended their operations to other parts of Scotland and to Ireland. They carry on their work with great energy and skill, and with a business capacity which would do credit to any industry. Under their hands the development of strawberry cultivation may be said to be marvellous. Many of them have realised considerable fortunes, and all of them have prospered far beyond the same class of men who have been engaged in ordinary agriculture.

During the first half of the century the apples, pears, and plums grown in the Clyde valley were delivered in Glasgow by carts. In the upper reaches the carts were loaded the night before, and a start made shortly after midnight, to arrive in Glasgow in time to market the fruit and return home the same day. The fruit-dealers had smart light carts, and well-bred, clever, light-footed horses, and accomplished the journey of twenty miles very rapidly. When the horses knew the road the driver prepared for a comfortable sleep; and the story is told of a knowing horse having made his way to a haystack not a mile from home, while the driver slept on, all unconscious, till near the time he should have arrived in Glasgow. Now that is all changed. Fruit-growers will start pulling strawberries at two and three o'clock in the morning, have the fruit packed, weighed, loaded into spring-vans, and driven at a rapid rate to the nearest station, for the first train to Glasgow. Many growers go to Glasgow every morning, see their fruit sold, and are back home by two o'clock for the direction of their work.

Not only is the strawberry a most enticing fruit, but it is a most wholesome food, and one which, when eaten in its natural state, is improved by adding other wholesome food in the shape of sugar and cream. It is also said to possess medicinal virtues for rheumatic patients. But no fruit goes to waste more rapidly after being pulled, so much so that the preserve-works will not take delivery of strawberries on a Saturday. They require to cease work early on that day, in terms of the Factory Act, and if the fruit was allowed to stand over till Monday, it would be rendered useless for preserving, and would not keep. On that account the work of Saturday begins with daylight, and continues till seven o'clock in the morning, when the fruit gathered is despatched with the early passenger train to Glasgow, and is sold for table purposes. When the berries are ripe the work again begins on Monday morning at daylight, and is continued as before till seven o'clock, for early delivery to the Glasgow market. As the weather is sometimes both wet and cold, employers provide hot tea for the workers, and after one or two hours' rest pulling again begins, and if there is much fruit likely

to become over-ripe, the work continues till eight or nine o'clock at night. And in the very height of the season it is no unusual thing for this long and trying day to continue for the first five days of the week. Fruit for table should not be over-ripe, or it will not stand the railway journey; it should be of a bright red attractive colour to bring the highest price. It is pulled with a small bit of the stalk, and gathered in oblong baskets which hold about 10 lb. The overseer collects these baskets as they are filled, and carries them to the cross-roads, whence they are taken to the fruit-house to be weighed. The weight of each is marked on a small bit of cardboard and fastened to the basket, four of which are firmly packed in a hamper, covered with green rhubarb-leaves, sometimes grass, and sometimes hay or straw. Larger hampers hold eight of these baskets, but are not so handy. This early work is pushed on with very great diligence, every effort being made to put forth as large a consignment as possible; for fruit pulled in the morning often brings  $\frac{1}{2}$ d. or a 1d. per lb. more than berries pulled the day before and standing over all night. The hampers are then loaded into spring-vans, driven up the steep roads at great speed, and despatched by the early passenger train at half-past seven o'clock. This arrives in Glasgow before nine o'clock, where the railway company provide lorries to have the fruit instantly conveyed to the fruit-brokers. Some brokers, such as Messrs Williams, conduct their sales in the fruit-bazaar; and other firms, such as Messrs Simons, Jacobs, & Co., have most extensive private premises of their own. And now begins a most animated and exciting scene. Fruiterers are there from every part of the city, and when supplies are short, competition is keen and prices high. Each hamper is exposed to auction separately, the lid is opened and the fruit exposed to view, the name of the exposor being given. The sales are conducted with great alacrity, and the market is often finished by eleven o'clock. Buyers have their vans waiting, in which the hampers are driven to the shops all over the city, where they are at once exposed to sale for the day's consumption. Some growers make private contracts with the large fruiterers for the season's supply.

The quantity of strawberries passing through the hands of the Glasgow salesmen during the season is very great. Messrs Simons, Jacobs, & Co. sell 60 tons of English strawberries and 150 tons of Scottish,—all the latter coming from the Clyde district except about 5 per cent. The quantity of Scottish strawberries sold in Glasgow for table purposes will average 600 tons during the season, which is equal to about 20 tons per day. There was despatched 29 tons of strawberries from Braidwood Station alone in one day of last year. Part of the fruit is also packed in punnets, which are small square boxes holding

about 1 lb. weight, as their name indicates. These are packed in crates holding four tiers, and thirty-two in all. They are increasing in favour, and the buyer can carry home the fruit in the punnet, and being of small value need not necessarily be returned. Some growers possess hampers and crates of their own, but the great bulk of the trade is conducted in hampers belonging to the salesmen. The charge made is 4d. for each hamper, in addition to 5 per cent on the amount of sales, making together nearly 10 per cent. The number of baskets owned by Messrs Simons, Jacobs, & Co. amounts to 3000, and other salesmen also own large numbers. When the fruit is sold for preserving it is pulled without the stalk, a small quantity is sold in baskets, but nearly all is packed in kegs and barrels, containing about  $\frac{1}{2}$  cwt. and 1 cwt. each. Growers make private contracts with the preserve-works early in the season, prices ranging from £15 to £25 and £30 per ton, according to the prospect of a scarce or plentiful crop. Fourteen years ago a Glasgow manufacturer gave an open order of £42 per ton for preserving strawberries; while in 1890, a wet season, when the fruit was not good, as low as £10 per ton was received. In 1891 large contracts were placed at £20 per ton, and at that price a fairly remunerative return is made to the grower. That same year, on several days, when a glut in the market for table-fruit occurred, prices fell to  $\frac{1}{2}$ d., 1d., and 1 $\frac{1}{2}$ d. per lb., and it is needless to say that at that price the fruit was grown at a loss.

The following are a few extracts of the prices realised at the public sales in Glasgow in 1890: 16th July, 2 $\frac{1}{2}$ d. per lb.; 18th, 3 $\frac{1}{2}$ d.; 22d, 1 $\frac{1}{2}$ d.; 24th, 2 $\frac{1}{2}$ d.; 28th, 2d.; 29th,  $\frac{1}{2}$ d.; 30th, 1 $\frac{1}{2}$ d.; August 2d, 1 $\frac{1}{2}$ d.; 7th, 2d.; fine early fruit bringing as high as 5d. lb.

In 1891—July 13th, 3d. per lb.; 15th, 2 $\frac{1}{2}$ d.; August 1st, 3d.; early fruit realising from 4d. to 6d. per lb.

The following is the quantity of strawberries sent from Braidwood Railway Station, near Carlisle, during the season of 1891:—

	Tons.	Cwts.
To Glasgow . . . . .	469	10
Govan . . . . .	41	13
Paisley . . . . .	113	7
Dundee . . . . .	54	6
Crieff . . . . .	28	12
Dumfries . . . . .	11	5
Edinburgh . . . . .	12	17
Arbroath . . . . .	3	0
Coatbridge . . . . .	2	0
Kilmarnock . . . . .	10	15
Old Cumnock . . . . .	12	18
Liverpool, Hartley's siding	117	15
Total . . . . .	877	18

This includes baskets and barrels.

In 1888 the following quantities were sent from other stations:—

	Tons.	Cwts.
From Carluke . . . . .	160	13
„ Lanark . . . . .	110	0
„ Auchenheath . . . . .	110	0
„ Netherburn . . . . .	75	0
„ Tillietudlem . . . . .	10	0

The larger part sent to Glasgow was for table use, and that sent to the other places for preserve-works; and it is singular to observe that, while early strawberries are sent to Scotland for table, so much as 117 tons 15 cwt. were sent to England for preserving, from one station alone.

The increase of preserve-works, combined with the gradual lowering of the price of sugar, gave a large impetus to strawberry cultivation. Thirteen years ago Messrs R. & W. Scott, who were amongst the first of the growers, started preserve-works on a comparatively small scale at Carluke. Possessing a practical knowledge of fruit, and devoting great energy and personal attention to the work, it has grown to very large dimensions, producing 1800 to 2000 tons of jams, jellies, and marmalade in a year. No damaged fruit is admitted, and from personal inspection, everything is carried on with such a regard to cleanliness as to vie with home-made preserves, and the make deservedly enjoys a high reputation all over the country. Strawberries are delivered to this firm and the other two works in Carluke direct from the farms, and this is of great benefit to the growers. Strawberries being our first ripe fruit, the demand for the jam is so great in the early season that it is delivered for consumption as soon as it is made. The use of jam by the working classes is increasing rapidly, and in many homes is in requisition at all times of the day. The writer finds, on sending refreshments to the hay and harvest-field, that the bread and jam is all consumed and the cheese left. When trade is brisk, and miners wages as high as they are just now, the nominal wage being 8s. per day, and some earning 10s., a quick and ready market is found in the large mining centres of Lanarkshire, for both fresh fruit and jam. The soft nature of the strawberry being all but prohibitive of any foreign competition, the demand is certain to go on increasing. And deservedly so, for of all the fruits of the garden or the field, it holds the palm. It is so perfectly safe and wholesome, and of such an agreeable taste and flavour that it is a universal favourite with all.

## CATTLE-FEEDING EXPERIMENTS, WITH AND WITHOUT SPICES.

By JOHN MILNE, Mains of Laithers.

SPICES or condiments are articles mixed with food with the view of rendering it more palatable, more digestible, or to stimulate the appetite. At agricultural shows special cattle-foods occupy a not unimportant portion of the space, and the quantities sold must be very considerable. Whether these spiced foods are as important in feeding animals as their vendors allege is a point on which there are differences of opinion; but it is true these spiced foods or condiments are used to a very considerable extent by some of the most successful exhibitors of fat stock, while not a few equally successful do not use them at all. Authentic experiments to determine the value or otherwise of volatile oils in assisting the laying on of flesh and fat, or in promoting recovery in the case of weak or sickly animals, so far as we believe, have not been published, and most of the opinions given by practical feeders we regard as little better than conjecture.

About thirty years ago Dr Anderson, then Chemist to the Highland and Agricultural Society, was asked by the Directors to analyse and report upon the concentrated cattle-foods then in the market; and his report, published in the 'Transactions' for 1861, p. 171, is very unfavourable to the use of such foods at the prices then charged. He says, "Before entering on details it may be well to state that, both from the analysis of one kind of concentrated food, as well as from purely scientific considerations, I had long since made up my mind that these substances did not deserve the attention of the farmer."

He gives analyses of six cattle-foods, and reported that the aromatic was in most cases fenugreek and caraway, with in some of them a bitter substance, probably gentian; and that he detected in some, Indian corn, locust-beans, rice-meal, linseed, and in one turmeric. He remarked "that the effects attributed to aromatics by the makers of these foods is in the last degree problematical and unsupported by any well-ascertained facts," and looking "at these foods merely in a nutritive point of view, it must be unhesitatingly asserted that they have nothing to recommend them. They are, in fact, inferior in this respect to many of the simple foods in common use—such, for example, as linseed or oil cake."

The experiments here detailed were made with the view of

discovering by actual feeding results whether the use of aromatic oils of known origin were of value in increasing weight in ordinary commercial feeding-cattle; and if so, we intended to have tried them separately to ascertain by experiment the one which produced the best results. The aromatic articles used were fenugreek, caraway, coriander, and aniseed in equal parts. The results of the first trial did not seem to call for trials with the individual stuffs; but to further test the effects of mixed aromatic seeds, a trial was made the following year on a more extended scale, and with some additional precautions for accuracy. Besides trials with aromatics of known origin, we thought it desirable to test some of the cattle spices extensively sold in the market, and visited all the stands at the Smithfield Fat Show of 1890. We found only one of the sellers there willing to risk a fair trial of his condiment and to have the results published; so the spice selected and used at Mains of Laithers and Lessendrum came direct from that merchant. All the experiments at Mains of Laithers were made in the same large well-ventilated byre. In 1890 experiments were made upon two lots, or rather four lots of cattle. To carry out an experiment of this nature two equal lots of cattle are required, one of the lots to receive the aromatic stuffs, and the other lot to compare with them, fed in the same way, but with spice omitted. The first lot consisted of eight Irish-bred shorthorned bullocks rising two years old, very equal and excellent cattle; on these the experiment was continued for three months. The general dietary consisted of 80 lb. of pulped turnips and chaff mixed before use with 1 lb. of linseed-cake, 1 lb. of decorticated cotton-cake,  $\frac{1}{2}$  lb. of locust-beans, and  $\frac{1}{2}$  lb. of bean-meal. The cattle were tied in pairs, and when the pulp was put into the stalls,  $1\frac{1}{2}$  oz. of the spice was at once mixed with it in each of the three meals. The quantity each steer received was thus 2 oz. daily, made up of equal parts of fenugreek, caraway, coriander, and aniseed. Oat-straw *ad libitum* was given, and was checked by weighing for a fortnight during the experiments; the quantity consumed by each lot was practically the same. (See Table I.)

Another experiment was made at the same time as the above with a lot of eight Canadian bullocks, well bred, and of good shapes, imported three months before the experiment began. They were fed in exactly the same way, receiving the same quantities of pulped turnips and mixed feeding-stuffs; but they consumed about one-sixth more straw. The experiment was continued for two months only. The progress of the cattle was not so equal over the lot as the Irish bullocks, which were a year younger, but almost the same weight. Both lots were quite fat at the end of the experiment. The Canadian cattle



were sold, and turned out 54.07 per cent of unfasted live-weight after deducting from the carcass 14 lb. for green weight. (See Table II.)

TABLE I.

1. Four Irish Bullocks, fed with pulped turnips, cake, &c., along with 2 oz. aromatic food daily.													
No.	Weight, Jan. 23, 1890.			Weight, Feb. 20, 1890.			Weight, March 20, 1890.			Weight, April 17, 1890.			Increase, 84 days.
	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.	lb.
9	9	0	0	9	2	8	10	2	0	10	3	7	203
10	10	3	9	11	2	17	11	3	20	12	2	3	190
11	10	1	16	10	3	12	11	2	0	11	3	9	161
12	9	3	21	10	2	0	11	0	15	11	1	20	167
	40	0	18	42	2	9	45	0	7	46	2	11	721
Average gain per } 28 days				67½ lb.			69½ lb.			43 lb.			180½

2. Four Irish Bullocks, fed same as above, but spice omitted.													
13	9	3	26	10	2	17	11	0	14	11	1	20	162
14	9	3	5	10	2	1	11	0	9	11	2	2	193
15	9	0	0	9	1	21	10	0	0	10	1	22	162
16	9	3	5	10	1	7	10	3	21	11	1	0	163
	38	2	8	40	3	18	43	0	16	44	2	16	680
Average gain per } 28 days				65½ lb.			62½ lb.			42 lb.			170

The next experiment was begun on 27th November 1890 with a lot of eight Irish bullocks, six quarters old, that had been for one year on the farm. They each received 60 lb. of pulped turnips and 3 lb. of same mixed feeding-meals daily. Four of the cattle began with 2 oz. of mixed aromatic stuffs and 10 oz. of crushed oats. This was continued for twelve weeks, when the 2 oz. of aromatic stuff was discontinued, and 2 oz. of oats substituted for the next nine weeks. The other lot of four for the first twelve weeks received 12 oz. of oats, and for the following nine weeks 10 oz. of oats and 2 oz. of aromatic stuffs daily. The progress of the two lots is thus comparable with each other, and the first period of each lot is comparable with the second period of the same lot. The first lot consumed an average of 13½ lb. of oat-straw, and the second lot 13¾ lb. per

day in the two weeks in which it was weighed. (See Table III.)

TABLE II.

1. Four three-year-old Canadian Bullocks, fed with 2 oz. of aromatic food daily, with other foods same as four below.				
No.	Weight, Jan. 23, 1890.			Increase in 56 days.
	cwt.	qr.	lb.	
1	10	1	14	112
2	10	0	0	77
3	10	3	14	132
4	9	0	17	134
	40	1	17	455
Average gain per 28 days			52½ lb.	113¼
2. Four three-year-old Canadian Bullocks, fed same as above, but with spice omitted.				
5	10	1	14	77
6	9	3	21	103
7	9	3	26	146
8	10	1	6	115
	40	2	11	441
Average gain per 28 days			42¾ lb.	110¼

A farther experiment was made upon a lot of eight cross-bred black heifers, rising two years old, with a purchased condiment given at the rate of 12 oz. per day, being the quantity recommended by the vendor. The general dietary consisted of 60 lb. of pulped swedes and 3 lb. of feeding-meals, made up in same proportions as already described. In carrying out the experiments, Dr Aitken was consulted. His advice was willingly given, and he kindly undertook an analysis of the four aromatics—viz., fenugreek, caraway, coriander, and aniseed mixed in equal parts—and of the purchased condiment; and he recommended that, as crushed oats have a composition almost identical with the purchased condiment, an equal weight of oats should be given to the lot not receiving the condiment to

TABLE III.

1. Four Irish Bullocks fed with pulped turnips and meals.											
WITH SPICE.						NO SPICE.					
No.	Weight, Nov. 27, 1890.	Weight, Dec. 25, 1890.	Weight, Jan. 22, 1891.	Weight, Feb. 15, 1891.	Increase, 12 weeks.	Weight, March 10, 1891.	Weight, April 16, 1891.	Weight, April 23, 1891.	Increase, 9 weeks.		
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	lb.		
15	7 3 5	7 3 16	8 2 0	8 2 4	83	8 3 6	9 0 4	9 0 0	52		
86	8 1 24	8 1 0	9 0 13	9 1 12	100	10 0 7	10 1 8	10 0 17	89		
13	6 1 3	6 3 0	7 1 2	7 2 19	156	8 1 20	8 2 21	8 3 6	127		
16	8 2 18	9 0 14	9 1 26	9 3 18	137	10 2 3	10 3 14	11 0 3	128		
Average increase	31 0 22	32 0 2	34 1 13	35 1 22	476	37 3 8	38 3 19	38 3 26	396		
		23 lb.	65½ lb.	30½ lb.	119	66½ lb.	30½ lb.	1½ lb.	99		

2. Four Irish Bullocks fed with pulped turnips and meals.											
WITHOUT SPICE.						WITH SPICE.					
No.	Weight, Nov. 27, 1890.	Weight, Dec. 25, 1890.	Weight, Jan. 22, 1891.	Weight, Feb. 15, 1891.	Increase, 12 weeks.	Weight, March 10, 1891.	Weight, April 16, 1891.	Weight, April 23, 1891.	Increase, 9 weeks.		
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	lb.		
90	8 1 0	8 2 25	8 2 25	9 0 22	106	9 3 7	10 1 7	10 1 13	131		
82	8 1 0	8 3 0	8 3 12	9 0 14	98	9 3 7	10 1 0	10 1 0	126		
12	7 2 0	7 3 10	8 1 13	8 2 13	125	9 1 21	9 3 7	9 3 16	143		
100	7 1 4	7 2 19	7 1 17	7 2 11	35	8 0 24	8 2 8	8 2 11	112		
Average increase	31 1 4	32 3 26	33 1 11	34 2 4	364	37 1 3	38 3 22	39 0 12	512		
		47½ lb.	10½ lb.	33½ lb.	91	76½ lb.	46½ lb.	4½ lb.	128		

balance the useful constituents in it. This was done in all subsequent trials. Dr Aitken's analyses are as follows:—

	Mixed Aromatics.	Purchased Condiment.	Average of Oats.
Albuminoid compounds . . . . .	18.81	11.16	10
Oil . . . . .	12.55	5.75	5
Mucilage, sugar, starch, &c. . . . .	37.49	60.87	60
Woody fibre . . . . .	8.90	5.22	10
Moisture . . . . .	13.90	11.35	12
Ash . . . . .	8.35	5.65	3
	<u>100.00</u>	<u>100.00</u>	<u>100</u>

TABLE IV.

1. *Four black polled Heifers, fed with oat-straw, 60 lb. pulped swedes, 3 lb. feeding-meal, and with 12 oz. purchased condiment daily for thirteen weeks.*

No.	Weight, Jan. 22, 1891.	Weight, Feb. 19, 1891.	Weight, Mar. 19, 1891.	Weight, April 16, 1891.	Weight, April 23, 1891.	Increase, 13 weeks.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	lb.
60	9 1 24	9 3 24	10 0 5	10 1 23	10 2 7	123
4	8 3 15	9 0 24	9 3 13	9 3 0	9 3 11	108
73	8 3 0	8 3 22	8 3 22	9 2 5	9 1 11	67
2	8 1 11	8 2 27	9 0 14	9 2 18	9 2 5	134
	35 1 22	36 3 13	37 3 26	39 1 18	39 1 6	432
Average per period }		39½ lb.	31¼ lb.	40 lb.	- 3 lb.	=108

2. *Four black polled Heifers, fed same as above, condiment omitted, but 12 oz. oats instead.*

5	9 0 0	9 1 2	9 2 27	10 1 22	10 2 0	168
6	9 0 20	9 1 13	9 0 12	9 2 17	9 3 15	79
3	9 0 5	9 1 0	9 3 0	10 1 0	10 1 21	156
1	9 0 26	9 2 6	9 3 8	10 0 17	10 0 24	110
	36 1 23	37 1 21	38 1 19	40 2 0	40 1 4	513
Average per period }		27½ lb.	27½ lb.	58½ lb.	15 lb.	=128½

The average weight of straw consumed by the four receiving spice was 8½ lb. each per day. By those receiving no spice, but an equal quantity of oats, 9 lb. per day.

Summary of results obtained in trials with feeding cattle on aromatic stuffs on farm of Mains of Laithers, Turriff. Each lot consisted of eight cattle; of these four received the aromatic stuff, and on four it was omitted.

	Trial lasted. Weeks.	With spices. Gain in lb.	Without spices. Gain in lb.
Eight cattle . . . .	12	721	680
Do. . . . .	8	455	441
Do. . . . .	12	476	364
Do. . . . .	9	512	396
Do. . . . .	13	432	513
	54	2596	2394
Forty cattle, average increase per day		1.72	1.58

#### MR FERGUSON'S EXPERIMENTS.

The next detailed experiment was undertaken by Mr George A. Ferguson on his farm of Lessendrum, Huntly; and on whose care and accuracy full reliance can be placed. Mr Ferguson had before conducted feeding experiments, and has had several years' experience with the weigh-bridge. This experiment consisted of twelve Canadian cattle in three lots. Each lot consisted of two bullocks rising three years old, and two bulls rising two years old. The general dietary consisted of 94 lb. swede turnips, 14 lb. oat-straw, 2 lb. linseed-cake meal, 2 lb. decorticated cotton-cake meal, 1 lb. of locust-bean meal, and 1 lb. of bean-meal mixed. Lot 1 had in addition 12 oz. of crushed oats during last six weeks. Lot 2 had 10 oz. of crushed oats during last six weeks, along with 2 oz. of equal parts of fenugreek, caraway, coriander, and aniseed during whole period. Lot 3 had 12 oz. of the purchased condiment during the whole eight weeks, in addition to general dietary. No. 11 unfortunately choked twice during experiment, and thus at its termination was 54 lb. behind the average increase of the other bulls; but as loss of increase was made up within a fortnight of the finish of the experiment, Mr Ferguson thinks it right to add 54 lb. to his weight, which makes the increase of lot 3 a little over that of the other lots. For the first fortnight, however, lots 1 and 2 did not receive the oats to balance the nutritive value in condiment; and if this is taken into account, it would appear from Mr Ferguson's experiment that aromatic or condimental ingredients exercise but small, if any, effect in increasing the weight of that class of cattle. (See Table V.)

These experiments we regard as not altogether conclusive; but they are an honest attempt, carried out at considerable cost and labour, to test the value of the articles in the feeding of cattle. One difficulty in feeding experiments is, that all

TABLE V.

1. Four Canadian Cattle, receiving each, during last six weeks, 12 oz. of crushed oats, in addition to general dietary.													
No.	Weight, Jan. 12, 1891.			Weight, Feb. 9, 1891.			In- crease.	Weight, Mar. 9, 1891.			In- crease.	Total in- crease.	
	cwt.	qr.	lb.	cwt.	qr.	lb.	lb.	cwt.	qr.	lb.	lb.	lb.	
1. Steer	9	3	0	10	1	2	58	10	2	14	40	98	
2. "	9	3	14	10	3	7	105	11	0	5	26	131	
3. Bull	9	2	26	10	0	25	55	11	0	0	87	142	
4. "	8	1	18	9	0	19	85	9	3	18	83	168	Per day.
	37	3	2	40	1	25	303	42	2	9	236	539	=2.40

2. Four Canadian Cattle, receiving each 2 oz. of equal mixture of fenugreek, caraway, coriander, and aniseed, and 10 oz. of crushed oats, for last six weeks, in addition to general dietary.													
5. Steer	10	3	0	11	0	4	32	11	2	21	73	105	
6. "	10	1	7	10	3	10	59	11	1	12	58	117	
7. Bull	8	3	14	9	2	7	77	10	1	7	84	161	
8. "	8	2	25	9	1	14	73	10	0	23	93	166	
	38	2	18	40	3	7	241	43	2	7	308	549	=2.45

3. Four Canadian Cattle, receiving each 12 oz. of purchased condiment daily, in addition to general dietary.														
9. Steer	11	1	12	11	2	24	40	12	1	20	80	120		
10. "	10	1	0	10	2	20	48	11	0	27	63	111		
11. Bull	8	1	14	8	3	7	49	9	1	10	59	108		
12. "	9	0	10	9	3	7	91	10	2	8	75	166		
	39	0	8	41	0	2	228	43	2	9	277	505		
Add to No. 11 estimated loss of weight caused by choking													54	
													559	=2.50

the animals during the experiment do not thrive or increase alike. From one cause or other there is often one or two in each lot that do not do so well as the average, and this is

sometimes sufficient to turn the result one way or the other. In feeding experiments the larger part of the fodder must of necessity be the same in all the lots, and the variation of kind applies only to a small part of it. In the five trials, comprising forty animals, at Mains of Laithers, however, probably a fair average of results has been got; and if so, it would seem that these aromatics have induced an increase of live-weight equal to about 1 lb. per beast per week, which at 4d. per lb. would do a little more than cover the extra cost of the articles used, which can usually be purchased at 2½d. to 3d. per lb.

---

## STACK ENSILAGE.

By ADMIRAL CAMPBELL of Barbreck, Lochgilphead.

HAVING made silage with Pearson's roller—one stack in 1889, 30 feet by 15 feet by 14 feet; two in 1890, each 20 feet by 15 feet by 14 feet; two in 1891, each 25 feet by 15 feet by 14 feet—we have had considerable experience.

Up to 1889 no *stack* silage had been made in the district; but such is the simplicity that, following such directions as could be obtained, we found the process as easy as haystack-making, and complete success in each year followed.

When near the end of 1889 we began to feed with it, we found that milch-cows and other cattle as well as sheep took to it immediately with the greatest eagerness. This continued all through the winter, so that the store stock had a mellow and nutritious food during the whole of that time. The most important effect, however, was upon the hogs. Few are ignorant that in many of the Highland districts, in consequence of that fell disease braxy, it has long been the custom to send those young animals to the low country to winter at great expense. In the winter of 1890 we retained 270 head, having a large quantity of silage of the *former* year, as good if not better than ever. The result was, that the loss was in proportion only to that of the hogs sent away. This means a most important advantage to the flockmaster—viz., that immediately the grass begins to get into that seared and unwholesome state so deadly to lambs, he (if he makes silage) has a food ready for them almost as digestible as nature's provision of which they have lately been deprived; not only so, but food prepared in a great measure from the coarser grasses cut during the tender and succulent state, instead of being left to decay and become poison

to those voracious young growing creatures. Considering that braxy is the effect of constipation, it stands to reason that a nutritious laxative is valuable in the highest degree. Those who have a knowledge of hogs, and are accustomed to trace cause and effect, will at once admit this. Again, by the making silage not only are the coarse grasses, but thistles, sprits, rushes, ferns, &c., and all wholesome herbage (*cut early*), made into this excellent winter food, but the ground is cleaned and cleared, instead of its valuable produce being left to rot and pollute the undergrowth, which when cut early throws up fresh growths, which become good pasture for the winter.

There are two rollers made by the patentee, one weighing when full of water 19 cwt., and the other 14 cwt. We got one of the former in 1889 and one of the latter in 1891, and find that the one makes as good silage as the other; this would seem to show that when the layers of grass are placed and (as a sailor would say) steadied down, the enormous weight of the material in its green state does its own work. But the absence of mechanical appliance is an obvious advantage, and the advantage to small holdings still more obvious and much greater, in the case of the small roller.

In all feeding with silage there is a great advantage to the animals in the extraordinary heat that the stuff retains *continuously*—that is, if it is taken from the stack as required.

In topping the stacks we use the worst hay we have, which becomes, by the time it is put before the animals, in their estimation the best; this of course is in consequence of the aroma and sweetness which it obtains from the fumes of the silage. The top in a few weeks settles down and requires attention.

Considering that in most if not in all the pastoral districts of Scotland wintering is the great difficulty, a process which increases winter-keep and renders it abundant, whatever may be the weather in summer and harvest, is surely a great boon. This is what silage does for the stock-owner, and its advantage to us in 1890 was very remarkable. The great and continuous rainfall, with piercing cold, damaged all the hay, and in many instances destroyed the turnips, as in our case, entirely, so that the scarcity of wintering caused great outlay for artificial food, but with us during that year it was sufficient. It is surprising that that year alone did not impress agriculturists with the value of silage. It was in former days a difficulty, when a hay-party was got together, to find work for them in broken weather; now, where silage is made, there is no difficulty, and no time is lost to employer or employed, while grass, if not suitable for hay through constant rain, can, before it loses its natural sap, be placed on the silo, thus saving the bleaching, which was the only resource formerly.



As we have only tried store stock on silage, I cannot speak of its comparative fattening qualities, except that it increases the milk of cows and much improves its quality, while ewes, both before and after lambing, are sustained in a remarkable way, showing, of course, also in the vigour of the lambs, and with all stock fed upon it, the following summer's grass tells *rapidly* and greatly.

In this process there is no skilled labour required beyond the usual cutting and stacking on all farms, with a good leader, all which advantages we had during the three seasons, and there was not a hitch of any kind. This year *both* stacks are excellent; and the animals, one and all, seem, if possible, fonder of the stuff than ever, probably on account of there being a small proportion of tares and beans cut while in the most succulent state.

There is a small pamphlet published by Messrs Thomas Pearson & Co. of Wolverhampton, giving very clear initial directions; and with it no intelligent man can have the slightest difficulty in directing the whole work successfully.

The apathy shown in many districts in following up this immense advantage is, it appears to me, nothing less than a misfortune to the pastoral agriculture of the country; but *stack* silage must make its way, from sheer force of its excellence, economy, and convenience, as well as paying qualities.

To sum up, even at the risk of repetition:—

1. Silage can be made when no other outdoor work can be done.

2. Even to small farmers who have not material to enable them directly to reap the benefit, it would provide employment.

3. The coarse grasses *cut early* come up again during the summer, and provide comparatively tender grazing for the early winter.

4. Silage being a gentle laxative, the cattleman or shepherd can mix it with hay, &c., as required, to keep his charge healthy.

5. A great deal of the richness of this feeding goes to the land, *instead* of the herbage, of which it is largely composed, decaying year after year and rotting on the ground.

6. In the days of built silos we used to hear of *sour* silage, but with the stack system there is sweet produce only. The material had to be taken to the silo; now the stack is placed conveniently for the material, saving great expense in labour and cartage.

7. I have said nothing of waste from the stacks, for really, if well made, the refuse is insignificant.

8. Surely, in these days of decreased and decreasing cropping, any useful and paying process which will give employment is a great public advantage, and should be encouraged, especially at

the present time, when both town and country are injured by excessive migration to the former.

I may add that the esteem in which this wintering is locally held is very remarkably and satisfactorily brought out by the fact that our working parties, who constantly see the preference shown by all the animals for good silage to *any* other feeding, work at the making of it with great spirit and zeal: but how could it be otherwise, considering that 100 tons, *at least*, of this wonderful auxiliary have been suddenly added to our annual resources?

#### ADDITIONAL NOTES.

Silage, as we use it, is an auxiliary in feeding, and therefore it does not admit of direct comparison with any other food; but the effect of its addition is very marked, for instance, on milk in quantity, and sweetness especially, never having any taste such as raw and semi-raw turnips impart. The breeding ewes are much more vigorous than when on hay, even with a judicious quantity of turnip, and the lambs are much better.

I think silage, ton for ton, costs less than turnips. As to the effect on stock, the heat of the former in winter gives great advantage over the cold (sometimes extreme) of the latter. There is no fear of silage not being consumed in its warm state, if so given, as all animals eat it more readily than any other food, not only selecting it in the racks, but moving in a body after the men conveying the food, and actually snatching this part of it out of their hands; still, such is the aroma which silage imparts, that whatever has been mixed with it is next in estimation—in short, a “kitchen” has been provided. It should be noted in favour of silage that it is gaining in quality while turnips in spring begin to perish. It is available for feeding purposes at the most scarce season of the year—viz., spring. It is, as I have said, made when little else can be done.

Silage, properly made, is undoubtedly as good the second year as the first; to say the least, it *loses* nothing by keeping for that time.

I do not think Pearson's roller essential exclusively to the making of good silage. We have not had experience of any other method, having been satisfied with the excellence of the former; but consider the absence of all mechanical appliance, and the simplicity of the system, especially with unskilled workers, great advantages.

Saving of waste depends much upon care in making and dressing of the stack as it goes up, and upon giving it 12 inches less spread at the eaves than it has at the base, gradually, of course—*i.e.*, if it is wanted 15 feet broad at the top, it should be 16 feet at the base, the ends in proportion.

The pasture where cut was free from decayed herbage, and gave really good pasture in winter.

I think hogs could be fed on silage and hay at one-fourth the cost of wintering in the south. We kept a large number of hogs in 1889 for a few weeks in the first of the season, but had then to send them away hurriedly, as braxy was very fatal. At this time the *first stack* of silage was *not* ready for use. There is no apparent difference, after a few weeks, between hogs retained and those sent away, but we have sent the *best* away up to this time.

A former difficulty seems to me to have been solved by giving tups silage and hay on returning from the hill; they are brought gradually to more concentrated food, which given incautiously at first, is a danger.

I do not remember any kind of stock that did not at once leave any winter feeding for early grass.

I merely state my opinion as to the cause of braxy, after much attention and experiment, but with no wish to dogmatise, and feel clear that the coarser grasses, especially when in a spongy and withering state, cause this scourge, while sown grass on land in cultivation tends remarkably to keep the animals in health, from being easy of digestion. I do not think the disease can be extirpated, but that it is in a great degree preventable. The days of much cropping in our districts are at an end, those of silage only coming: the latter, as a substitute for sown grass, is surely worth further attention and experiment by flockmasters. The laxative effect of silage is indubitable.

I think it would be injudicious to cut the rough pasture annually, but would cut it, say, every third year; in this way it would easily be kept down by the normal stock of cattle. Thus silage would dispose of grass (in its fresh state) up to this time in every stage of decay. The lands I speak of extend to between 4000 and 5000 acres, with much of this rough pasture. I believe the loss from braxy in our district, in rare cases where the animals have sown grass in any abundance, is from 5 to 9 per cent, while the normal loss, where such grass is not available, is from 15 to 25 per cent at least.

I now give a few figures as to our losses from 1889 to 1891 inclusive. On the 3d November 1891 braxy first appeared among 187 hogs wintering at home. Grass was very late during the whole season, and the disastrous harvest of 1890 had deprived us of the usual surplus store of fodder, including silage. We could not use the new silage until the 18th December. By that time (without silage) 18 of the 187 had died, and from the same date (18th December) to 20th January (with silage) only 6. This applies to the worst of 1000 hogs. In 1890, feeding on silage and hay, we lost 8 per cent out of 200,

and in the south the same percentage. In 1889 we did not know the value of silage; if we had, we would probably have kept the hogs at home.

In 1886 I had an excellent sheep-farm in my own hands which had been largely cropped, and we kept 200 hogs upon it for the winter, and only lost 5 per cent. The feeding was sown grass, rape (the latter for an hour or two daily), and hay. The loss wintering in the south that year was a small fraction under the same figure—5 per cent.

I would now like to say a few words more on the system of *stack* silage. It is computed, and I believe correctly, that every cubic yard of good silage weighs about 10 cwt.; so that a stack 30 feet long by 15 feet broad by 14 feet high contains in each yard of height (a large allowance being made for waste) about 24 tons, or altogether above 100 tons. It appears to me, therefore, that the pioneer of the system found a jewel of great value; that Pearson and others cut and polished it; but that success culminated in nature's infallible law of atmospheric pressure. In the *interior* of the stack that pressure is gradually but completely expelled, hence the valuable quality of the stuff in a compact air-tight cake keeping its freshness, aroma, and great heat through one winter and a great part of another; how much longer, I believe has yet to be found out. Still, without the first suggestion, the several plans of making, and dame Nature's finish, there could have been no success; and without a careful and experienced stack-maker success would be more than doubtful. See pamphlet already referred to.

## FEEDING AND MANAGEMENT OF WORK-HORSES.

By ARCHIBALD MACNEILAGE, Secretary of the Clydesdale Horse Society, Glasgow.

Two years ago I was privileged to write a paper on the "System of Management in Breeding Studs of Draught Horses," which appeared in the 'Transactions' for 1890. It has, I understand, been felt that there was room for a second paper, dealing with purely work-horses, and by the kindness of the Publication Committee, the duty of compiling this paper has again been deputed to me.

In the following pages the same method has been followed as in the earlier paper. Schedules of inquiry were issued to

owners of draught-horses in town and country, and replies have been received from the following: Mr Alex. Davidson, Glasgow, formerly owner of the well-known carriage-hiring business carried on under the name of Andrew Menzies; Messrs Cant & White, Yorkhill, Glasgow, who employ twelve horses; Mr Archibald Brechin, Keppochhill Road, Glasgow, who employs forty horses in what is generally regarded as the severest work in the city; Messrs Robertson & Son, Tureen Street, whose stud consists of about twenty horses; the well-known railway contractors, Wordie & Co., who employ the large number of 1100 horses in general carting as well as purely railway work; Captain Milne, horse superintendent of the Great Western Railway Co., Paddington, whose stud consists of not less than 1800 horses of one kind and another; Messrs Cowan & Co., the well-known Glasgow contractors, who employ 230 horses in Glasgow alone; Mr John Young, Inspector of Cleansing under the Board of Police, Glasgow, with a stud under his care equal in number to that last mentioned; and Mr Grierson, High Street, Glasgow, who has charge of the contracting department of the Glasgow and South-Western Railway, with 440 horses. Amongst those in the country who have given valuable aid are Mr George Brown, Watten Mains, Caithness, who employs from fourteen to sixteen horses in farm-work; Mr John W. Lumsden, Nevity, Cromarty, whose stud numbers thirteen; Mr J. G. M'Gregor, Fearn, Ross-shire, who owns eighteen farm-horses; the Dailuaine-Glenlivet Distillery Co. (Limited), who have a first-rate stud of smaller dimensions; Mr James Dickson, Damhead, Loanhead, thirteen horses; Mr John Dobie, Campend, Dalkeith, an equal number; Mr George R. Glendinning, Hatton Mains, fourteen horses; Mr Andrew Smith, Crumstane, Duns, eight horses; Mr A. Melville Caverhill, Crichness, Duns, whose stud varies in number from six to nine head; Mr H. Hewat Craw, West Foulden, Berwick, with a large farm-stud of twenty-six horses; Mr R. Shirra Gibb, Boon, Lauder, with ten work-horses as distinct from breeding stock; and Messrs Dickenson, Longcroft, Lauder, who have a stud of twenty-four work-horses. To each and all of these gentlemen and firms, and also to a young veterinary friend well acquainted with various large studs in London, my heartiest thanks are due and hereby tendered.

The varying sizes of the studs from which information has been gleaned should afford opportunity of securing information that will be of general interest and permanent value. Points in which the management is similar will be treated of in whole, and differences will be specifically referred to. The division with which we have set out will now be continued, and the city studs first disposed of.

## DRAUGHT-HORSES IN CITIES.

The age at which horses for heavy draught may be most advantageously acquired is a point of general interest, not only to those who immediately supply the city demand, but it is even of more importance to those who breed horses. A horse four or five years old when first put to work on the streets is, in the opinion of some, more liable to suffer from colds, influenza, and strangles, and has to be dealt with more carefully in graduating his work than one six or seven years old. Hence, while only one of those who have returned answers mentions four as a good age to buy at, others answer six to eight years, five to eight, five to seven, five to six—not under five, and not over six; and three return the unanimous answer that five is the most profitable age at which to purchase. This reply from so many owners holding such a diversity of stock is of value to breeders, because by it may in some measure be gauged the profits to be derived from breeding horses for the city traffic. A farmer with a stud of six mares, breeding, say, a couple of colts every season, can have the labour of these colts from the time when they are two and a half years old until they are five, and can then sell them, broken and well matured, for an average price of about £50 apiece. In this way there is a margin for a reasonable profit from horse-breeding; but it would not pay, were there no chances in the trade, if service-fees were to be £10 for each mare. If the horse-breeder's chief customer is to be the city contractor, he must have stallion service-fees at a rate considerably below the fashionable sire's figure.

There is a remarkable unanimity amongst our correspondents in favour of geldings for street traffic rather than mares. Six, including all of those having large stables, prefer geldings because they are less troublesome in the stables; mares when in season often giving rise to accidents. One prefers mares because, when disabled, they can be put to the breeding-paddock, and two are neutral. For very severe work in some quarters a manageable stallion is preferred before either the mare or gelding, and the opinion is expressed by a competent authority that more work can be got out of an entire horse than from animals of either of the other two classes. It is, however, within our knowledge that in some of the hardest work in which horses are engaged in Glasgow, mares with a bit of temper and spirit, which proved quite unmanageable on farms, have proved most serviceable and durable. One of the finest large mares bred in Galloway that ever passed through the hands of an eminent fancier in that district, after a checkered

career in agriculture, for many a long day wrought in a Glasgow contractor's stud, driving pig-iron. There is no more slavish work for either man or beast than this, and it was a proof of the constitution and endurance of this mare that she continued in it so long.

In some cases firms have farms to which horses are sent to recuperate, and those who have not are occasionally indebted to farmers for a good turn of a similar character. This system is, however, not in general favour, and indeed is only resorted to in the case of favourite animals. The great body of contractors work their horses until they die or become disabled. They are then either sold for what they will bring, or destroyed. Young fresh horses are wrought very carefully in posting work for some months after purchase, as when pressed too hard at first they develop curb, "spavin," and "splints." When carefully handled, however, at the outset, the average length of a horse's career at this class of work is from five to seven years. The length of the work-day of such horses is, however, very different from that of the ordinary draught-horse. From five and a half to six and a half hours per day is the length of the day when regularly employed in fast work; but the draught-horse's day is never less than ten hours, and in many yards it is twelve hours. In London, where horses have often very long journeys to perform at a slow pace, the time in the yoke is in some cases much longer; and although the tear and wear of such horses is very great, the owners seem to consider that the extra profits more than balance their heavy mortality in horses. This mode of treating horses is not peculiar to London, but is possibly more common in Glasgow than it is there.

Reference to this matter leads one to the question of the relative merits of the English and Scottish ways of yoking horses. Doubtless the reader has often been struck when visiting London by the difference between the clumsy-looking vehicles to which are yoked never less than three, and often four, big, heavy, slow-pacing horses, and the neat, trig one-horse lorry so common in Scottish cities. I was at some pains to secure accurate weights of the former class, and have reliable authority for the following figures: The tare of a big brewer's dray, to which never less than three horses were yoked, I found was 31 cwt. It was capable of carrying, when fully loaded, fifteen barrels, the weight of each being about 4 cwt. The gross weight of the vehicle therefore when loaded was 4 tons 11 cwt. This gives a draught of a fraction over 30 cwt. to each horse. The firm in whose yard this dray was found have recently adopted a modified form of the Scottish lorry as an experiment. The tare of it was 27 cwt., and it was capable of carrying a load of about 30 cwt. The gross weight of this lorry

was therefore something under 3 tons. It was drawn by two horses, whose share of the draught was thus not over 30 cwt. each.

The average loads of a Glasgow Clydesdale are very different. The best class of work-horses in Glasgow weigh from about 16 to 18 cwt. each. The average weight of the lorry in common use is about 19 cwt., and the average load carried by one of these lorries 2 tons 10 cwt. Sometimes, and indeed not infrequently, a ton more is put on; and it is no uncommon thing for a load of 4 tons to be taken by one horse from the railway goods stations to the docks. The average gross weight drawn by an ordinary contractor's horse in a Glasgow lorry is therefore not less than 3 tons 10 cwt. He is an active, quick-moving horse that draws this load behind him; and indeed it is only because he is so that such loads are possible to him. As long as he is kept going steadily forward there is not a great strain on his powers; but when suddenly halted, and as suddenly started in the middle of a gradient, as he often is, the energies of the compact, short-legged Clydesdale are brought into full play, and if he had not a plentiful supply of "grit" he could never overcome his task.

The loads, then, drawn by horses in London undoubtedly appear small when compared with the tasks allotted to draught-horses in Glasgow. But it must be borne in mind that the London dray-horses have often very long journeys to perform out into the country, over soft roads, and when in the town the asphalte and wooden pavements which so generally abound in the great city afford much less favourable footing for starting on than the granite causeway with which we in Scotland are familiar. Still, when every allowance for these considerations is made, there is, it will be readily admitted, a big margin in favour of the greater strength and agility of the Scottish horse, and the practical usefulness of the Scottish method of yoking, as compared with that in London. It is a further significant fact that there is in London a decided preference for Scottish horses.

#### FEEDING OF CITY HORSES.

In view of the nature of their work and the length of their working day, the method of feeding horses followed in large studs is of the utmost importance. A horse is an animal that can be easily supported on small rations at frequent diets, and hence the success which has attended the introduction of the nose-bag into the great majority of large studs. The stomach of the horse is small relatively to his other parts, and it is an ascertained fact that the mortality amongst horses has sensibly diminished since by means of the nose-bag it became possible to prevent long fasts in the case of horses having to travel long



journeys with heavy loads. The perusal of the replies received to our schedules points to the conclusion that the nose-bag might be in more general use than it is.

In regard to the method, time, and quantity of feeding given to each horse, scarcely any two of our correspondents are at one. Of course it could not be expected that the feeding in a posting establishment would be the same as that in a carting stud, but one is hardly prepared for the diversity that exists amongst the latter. This difference is brought prominently out in connection with private firms and public contracting firms. In London the result of our inquiries showed that horses were fed early in the morning before going out, and during the day at intervals from the nose-bag. On Sabbaths they are fed at 8 A.M., and again at 4 P.M., which is surely rather a long interval, and unless there be a large supply of hay furnished along with the morning feed, the plan is somewhat risky. In the stable of a firm engaged in brewing which we visited there are 150 horses. These are fed at the rate of from 37 lb. to 40 lb. of "chaff" per day for each horse, the quantity being regulated to the size of the animal. "Chaff" is a local name for what is known in some parts of Scotland as "chop," and consists of equal weights of grain (oats, maize, beans, and peas) and cut hay, *i.e.*, 20 lb. of grain to 20 lb. of cut hay. The morning and evening portions are given indoors, and the remaining one-third is carried in the nose-bag and fed as occasion offers on a journey. In the stud of a firm doing a very large contracting business the total given to each horse is the same—*viz.*, 40 lb., but the proportions are different. They feed 15 lb. of grain to 25 lb. of cut hay. We should say, from what we saw of the animals in these studs, that the advantages of the course followed in the private firm were obvious. The horses were in better "keep," and though neither stud could boast of much "condition" in the showyard sense, the brewer's horses had the better coat. There is no boiling of food in these stables, nor is it general to give boiled food in London studs. The dry feeding is believed to have an advantage on the score of economy, and undoubtedly it has resulted in a marked immunity from colics. Boiling the food would, however, conduce to greater sleekness of skin, and would be economical enough, because a greater proportion of maize, which is largely fed with in London, could be used with safety. The consensus of opinion is, however, in favour of dry feeding; and as a compensation for lack of boiling, some owners give once a-week a quantity of boiled linseed—a course which is commended by members of the veterinary profession.

The daily ration of the Great Western Railway Company for a London horse is 16 lb. hay, 14 lb. oats, 3 lb. beans, and 2 lb. bran. This is a total of 35 lb. dry feeding for each horse. The

country horse—that which has to make long journeys with or for goods into the country—has a greater variety in his food. He gets the same daily quantity of hay, beans, and bran, but his oats are reduced to 8 lb., and instead of the remainder he gets 6 lb. of maize. In addition each horse takes out a nose-bag feed of 2 lb., proportioned as above.

It will be observed that this is somewhat less in quantity than the feeding of the horses in the firms already referred to; and the railway horse gets bran instead of peas. This should tend to keep the bowels freer, and on the whole should be more conducive to health.

A private firm in Glasgow, with a small stud of twelve horses, feed four times daily—at 5 A.M., 9 A.M., 2 P.M., and 7 P.M. The same hours are observed on Sabbaths; but the quantities are reduced, and a little saltpetre is mixed with the food every Saturday morning. The feeding material at the three earlier diets consists of oats, beans, and cut hay; at 7 P.M. boiled food is given, consisting of beans, bran, and “masked” linseed. This giving of a boiled mash in the evening seems to be gradually dying out in the west, but in some of the smaller stables it is still popular. Another firm with forty horses feed, first, between 4 and 5 A.M., with 6 lb. of chop, consisting of oats, beans, Indian corn, and cut oat-sheaf. At twelve o'clock the horse is fed outside from the nose-bag with 12 lb. chop, and the evening meal is varied. Three days a-week it consists of a boiled mash, the ingredients in which are beans, barley, Indian corn, turnips, and bran,—surely very strong food,—with one bottle hay to each horse. The quantities and proportions in which these several ingredients are used vary, but the following is a good average. In the bottom of the boiler there is put a bag of cut hay, and the same is put on the top of the boiler. The quantities of other ingredients are—

Turnips	about	.	.	6 cwt.	Beans	about	.	.	$\frac{1}{2}$ cwt.
Barley	"	.	.	1 "	Bran	"	.	.	$\frac{1}{3}$ bag.
Indian corn	"	.	.	1 "					

These are boiled together and thoroughly mixed in a cooler, each horse receiving about 38 lb. weight of the mash as his evening meal. On the other days of the week the evening meal consists of chop, as in the morning, 6 lb., with a few carrots added, and plenty of good hay.

Another firm, with eighteen horses in their employment, feed with boiled mash both morning and evening. The first feed is given at 5 A.M., and consists of boiled beans, barley, Indian corn, and bran, with turnips if in season—a large pailful to each horse. The dry feed is given in the nose-bag during the day, and the morning meal is repeated at night, with plenty of hay and a

bunch of grass when in season. This firm has made a change recently in the form in which the mid-day meal is made up. Formerly clean hard victual, consisting of beans and oats, was sent out, but now the feed consists of bruised oats, bruised beans, bruised Indian corn, and cut hay, and their opinion is that the change has been beneficial in preventing colics and kindred ailments. This firm feeds at 8 A.M., 1 P.M., and 6 P.M., on Sabbath slightly reducing the quantities, but making no difference in the constituents of the food given. Of the private firms replying, this is the only one that feeds with boiled mash in the morning.

There are few better managed studs, and none in the city of Glasgow more creditable to all concerned with it, than that of the Board of Police. The horses are good specimens, appear in good health, and are always fit for their work. There are really two studs in this stable—a day-stud and a night-stud. Their work, except when a sudden snowstorm puts every one on his mettle, is regular, and every man and horse knows as a rule when and where his day or night will be. The stud being public property is of course managed on strict business principles and in a systematic fashion, down to the most minute details. It is in every way a model of its kind.

The working day is of ten hours, and the feeding hours for the day-stud are 4 A.M., 11 A.M., and 5 P.M., when cooked food is given. The night-stud gets one half-feed at 2 P.M. and another half at 8.30 P.M. or thereby; a full feed between 3 and 4 A.M., and another of cooked food at 11 A.M. The only difference in the diets on the first day of the week is that the quantity of grain feed is slightly reduced. The allowance to each horse is 20 lb. grain, 2 lb. bran, and 14 lb. chopped hay per day. At 4 A.M. each horse gets 7 lb. of grain, 4 lb. bruised oats, 2 lb. Indian corn, and 1 lb. beans, as well as a supply of chopped hay. The same quantities are repeated at the mid-day meal, with again a supply of chopped hay. At 5 P.M. the mess consists of 6 lb. grain, 2 lb. cooked barley, 2 lb. Indian corn, and 2 lb. beans, with 2 lb. bran in addition. The night-stud are fed on the same principles at the hours already specified, to meet the exigencies of their work. It will be observed that the daily feeding in this excellent stud is about the same in quantity per horse as in the Great Western Railway Co.'s stable at Paddington, but slightly less than in the London brewer's stud first referred to. The reduction, however, is in the quantity of hay given; and in the Glasgow stud Indian corn alone is given without peas. The London Contractor's feeding differs considerably from that given by our Glasgow correspondents—first, in that they give no cooked food; and second, in the excess of weight of hay over grain.

In the largest Glasgow railway stud, about which we have received a reply, the working day is fully ten hours. The horses are fed at 5 A.M., and leave the stable between seven and eight. They then get their supply of grain for the day, and are fed at night when they return. On Sabbaths in this stud the feeding is reduced in quantity by one-third, and in the other railway studs the same practice rules.

These firms have within recent years ceased to give boiled food in the evening, and they report as the result of this that there have been fewer cases of colic and inflammation of the bowels. On the whole, this opinion, in spite of adherents to the old method, of whom we have spoken, is general amongst horse-owners. The second railway firm above referred to gives the working day as twelve hours, and the morning feeding-hour as 4 A.M. and the evening hour as from 7 to 8 P.M. In both of these studs, and in railway stables generally, the nose-bag is in general use. The allowance to each horse per day is in this second case 38 lb., the division being left very much to the discretion of the driver. This quantity is made up of one-half cut hay and one-half grain. The 19 lb. of grain consist of 9 lb. crushed Indian corn, 8 lb. bruised oats, and 2 lb. peas.

Our third railway firm in the west, with a stud of 433 horses, feed first at 4 A.M. and again as opportunity offers while waiting for goods. On Sabbaths they feed four times—viz., at 4 A.M., 8 A.M., 12.30 P.M., and 5 P.M.; and on that day, as in the other two cases, the quantity of the food is reduced. No boiled food is given, and the weekly allowance for each horse is bruised oats, 56 lb.; bruised Indian corn, 35 lb.; bruised beans, 28 lb.; bran, 28 lb.; and cut hay, 77 lb. This gives a total of 224 lb. per week, or an equal portion of 32 lb. to each day. As, however, the diet is reduced by one-third on the first day of the week, the working day allowance will be about 34 lb. to each horse, leaving about 20 lb. for the rest-day.

In a communication published some little time ago by Mr J. Macdonald, Fort-William, a slightly varied mode of feeding was reported. The weekly allowance granted to each horse in the stud was 54 lb. oats, 20 lb. Indian corn, 39 lb. barley, and 61 lb. hay—in all, 174 lb., or a daily allowance of over 25 lb. per horse. I rather think, however, that this figure (174 lb.) will only be the allowance for the working week, so that the daily diet would be 29 lb. The cost of this weekly quantity would be about 8s. Part of the barley was given in a boiled mash, with a turnip or two added, and all the grain was crushed and all the hay chopped before being given. Each horse in this stud gets a rest for a week or ten days every summer, and they are put out every Sabbath to graze during the season. This

gentleman, in common with almost all other horse-owners condemns feeding with long hay or uncrushed grain.

The results we have reached may now be summarised thus :—

London Brewer's feed per day—

20 lb. grain + 20 lb. cut hay = 40 lb.

London Contractor's feed—

15 lb. grain + 25 lb. cut hay = 40 lb.

G. W. Railway Company's feed—

17 lb. grain + 2 lb. bran + 16 lb. cut hay = 35 lb.

Glasgow Board of Police—

20 lb. grain + 2 lb. bran + 14 lb. cut hay = 36 lb.

Cowan & Co., Glasgow—

19 lb. grain + 19 lb. cut hay = 38 lb.

Mr Grierson, Glasgow—

23 lb. grain + 11 lb. cut hay = 34 lb.

Country Contractors, Fort-William—

18½ lb. grain + 10 lb. cut hay = 28½ lb.

In a large posting establishment the kind of feeding used for many years was in the proportion of two parts bruised oats to one part bruised beans, and one part bruised Indian corn, equal to about 16 lb. in all for each horse per day, with best cut ryegrass and timothy hay mixed with the foregoing, and uncut Dutch hay by itself, equal to about 12 lb. hay in all for each horse per day. Thus the total weight of food to each horse was 28 lb. per day. For some years Canadian or Russian oats were used in preference to Scottish or Irish oats; and for bedding, flail-thrashed Dutch straw was preferred to home straw. The feeding was varied during seven months in the year by a hot mash being given four or five times a-week, once always on Sabbath, this mash consisting of turnips, Indian corn, barley, cut hay, and bran. On these occasions less ordinary feed of course was given.

Mr Davidson gives it as the result of a long experience, that it is of vital importance for the economical management of a stud of horses of any considerable number, that one man alone should be charged with the duty of proportioning and mixing the feeding ingredients, and the same man should exclusively feed every individual horse. For this duty only a man of intelligence, experience, and watchful care should be employed, noting as he goes along if each horse has eaten up the whole of

his former feed, and at once reporting to his foreman when he has found any case in which he suspects that a horse has gone off his "feed." Where men are allowed to feed their own horses they are ready to over-feed them, and many valuable horses have been lost through this.

### GROOMING.

Few details are furnished by any of our correspondents regarding the grooming of their horses, especially when these come in wet and damp. The tools in most common use are the curry-comb, dandy or whalebone brush, and body or fibre brush. When horses are brought in wet and dirty it is a good plan to scrape them well down with a flexible scraper (a barrel-hoop is a useful substitute), then rub them vigorously down with a wisp of straw, and put them into a comfortable stall. In posting stables they should then be sheeted and left until they are thoroughly dried and warmed up; after this they should be groomed all over with curry-comb and dandy brush. The use of cold water on the limbs and pasterns in their wet state has been found to be conducive to the development of greasy heels and legs; and in Mr Davidson's stud the use of water at any time on the limbs was discouraged. As a result the stud enjoyed a long immunity from greasy heels and sand-cracked hoofs. These ailments, however, are not nearly so common amongst posting-horses as they are amongst draught-horses.

### STABLING.

Although we have reserved it until this stage, a consideration of the stabling provided for work-horses is not the least important part of the present inquiry. Great diversity in this respect exists, and some of the stables visited have fairly astonished us. In one day, in London, we visited five or six stables. The first was that of a private wealthy firm in South London. It is a useful, airy, well-built structure, with accommodation for fifty-two horses. The stalls on one side of the long building measure 10 feet by 6 feet. Down the other side there is a row of loose-boxes measuring 11 feet by 8 feet. The stalls are divided by boarded-up "travises"; the feeding-troughs are of wood; and there are no hay-racks. As already indicated, feeding with long hay is practically unknown in the cases under review, and hence hay-racks are unnecessary. A notable addition to the population of the stable-yard was a piggery, in which were half-a-dozen breeding sows. These were kept out of the refuse of the food provided for the stable, and were a clear source of direct profit as well as a means of preventing loss, as

no food is ever at any time wasted. This is a system that might be generally adopted in Scotland in connection with large studs of draught-horses.

The next stable visited was that attached to a very large fruit-farm in Kent. There was nothing remarkable about this stable, except that, if it were found on a Scottish farm, the landlord would have little peace until he erected a new one. But our succeeding call was a revelation in stable management. This was the Royal Naval Arsenal Co-operative Society's (Limited) stable at Woolwich. A more sumptuously fitted up stable it has never been our lot to see, either in the hands of a private gentleman or a public company. The company own fifty-nine horses of one kind and another, including cart-horses and ponies of different sizes. The ground-floor is in three divisions, containing twenty-eight stalls and two loose-boxes; the height of the ceiling being about 16 feet, and the size of the stalls 7 feet square. On the first storey there are the same number of stalls, but they are slightly less roomy, and the ceiling is not so high; the third storey is occupied as a granary and hay-loft. The floors of the stables are of bevelled blue bricks; the walls are lined with glazed tiles, and the floor of the granary is laid with pitch-pine blocks or squares. The ventilation is of the latest and most approved pattern. The feeding-troughs are of light glazed iron, and are not movable. There are no hay-racks, as the food is all chopped and bruised. There are independent shoots from the granary to the first and second floors; and in the granary are all modern forms of machinery for grinding, bruising, and chopping food. Each horse is bound by a double tether running through rings attached to each end of the feeding-trough. There is also a ring in the wall at the level of the top of the horse's head, for tying up the head when necessary. There is a harness drying-room attached to each stable, and this is a convenience which should be found in every large stable. There is nothing better calculated to cause sores on the shoulders and backs of horses than harness that has been insufficiently dried before being again used. The total cost of this stable for sixty horses I was informed was £6000.

If the last-mentioned stable was overdone in respect of style and convenience, the next we visited was not overweighed with these things. It was a large open building, separated into three divisions, in which would be accommodated about eighty or ninety horses. A passage runs up the centre of each division, and the horses are only separated by what are called "bales." This is undoubtedly a good healthy summer stable, but it would be useless in our cold northern climate. The other stables visited were well-appointed and healthy, but unmarked by any peculiar features.

There are several stables in Glasgow that well merit notice. One of these is owned by the Board of Police. The Board have stables and works for the treatment of city refuse at various points in the city, but the newest and most complete are at Kelvinhaugh in the west end, and quite close to the Queen's Dock. The Refuse Works are very complete, and merit a visit. An interesting description of these works might be given, but the stables only concern us at present. These are built in one row, running from east to west, and situated on sloping ground to the left of the entrance. The first storey of the building is nearly on a level with the road, and is approached by a cross gangway, leading on to another long gangway, and joining it nearly at the centre of the building. The ground-floor forms an open shed for the dust-carts, watering-carts, mechanical brushes, &c., which form part of the utensils of a great city cleansing department. The building is about 250 feet long, and the first storey is divided into six stables, containing six stalls and two loose-boxes each, thus affording accommodation for forty-eight horses. The gangways, both cross and the gangway extending the length of the building and affording access to the several stables, are fireproof in bottom. They rest on iron girders with coupled plates on the top. On this there is laid a bed of concrete, and above this a 4-inch causeway.

The length of the gangway is 250 feet. Each stable is 30 feet long outside, and the walls are 9 inches thick. The stalls measure 10 feet from wall to heel, by 6 feet 6 inches from centre to centre of heel-posts. In front of the horses and up to the height of their heads the walls are of white enamelled brick. This admits of the stable being kept clean, as these, being easily reached, are frequently washed down, thus securing a uniformly fresh feeling in the stable. The mangers are of iron, resting on fillets at the ends, and checked above with wooden blocks to prevent them rising. In all the stables of the Board the mangers are of uniform size, so that if one is damaged it can easily be replaced. The boxes are each the size of two stalls, and are reserved for the use of older horses that are slow to lie down when resting. The travises are protected at the heels by an iron plate  $\frac{3}{8}$ -inch thick, and measuring 3 feet by 2 feet 6 inches, which is nailed to each. There is a spar-roof, and ventilation is secured by a simple fan at the ridge; and there are windows on the north side of the stable which serve the double purposes of light and air. The upper sashes of these are hinged to open inwards, so that any draught goes up and does not injure the horses. As originally built two stables were under one roof, but otherwise separated by brick walls. The advantages of complete isolation in the case of an outbreak of an epidemic like "Pink-eye" have been so marked, that it is



intended to make each stable absolutely self-contained, by building up the division walls to the outside roof. Light is further obtained by means of skylights, which, however, do not open. The horses, when working, are watered at troughs in the yard underneath, but for convenience on Sabbaths and other occasions there are two 3-inch taps on the gangway, to which a hose can be attached for washing purposes.

The stables are provided with sliding-doors, and on the inside of each rear-post is a long peg on which the collar is hung, and on the outside of the post is a seat for the saddle, with brackets for other harness. At the western end of the building there is first, and next to the sixth stable, a harness drying-room, 15 feet square, having a tile-floor, enamelled brick walls, and a range of steam-pipes led along the floor and around the walls. Above these there is a row of benches running right round; and there are six hanging-poles from the ceiling, on which articles requiring to be dried are laid or hung. A drying-room, in some form or other, is attached to all the stables of the Board, but the Kelvinhaugh room, being the newest, is the most complete. Beyond the drying-room there is an isolated loose-box of the same extent, for the treatment of special cases. It has no connection with any other part of the building, except that it is under the same roof. There is no communication in any way between it and the other stables.

Next comes the granary and steaming vats, which take the place of what would formerly have been known as the boiler-house. These vats are made of cast-iron, with copper false bottom, perforated. The steam is led in pipes from both sides of the vats, down underneath the copper bottom, and rises through the holes up to the food. An ingenious contrivance of a screw, working into a "nicked" wheel, placed at the side of each vat, enables the person emptying the food to set the vat at any angle convenient for him. One man alone has charge of the yard, and of the preparing and dividing of the food to each horse. The driver of each horse brings his pail to him and he fills it; while the dry food is also apportioned by him. The wheels of the coolers are fitted with india-rubber tires, to prevent the night horses being disturbed while the day horses are being fed.

Every cart has to be washed at breakfast-time and again at stopping-time. A hose is fitted in the yard for this purpose; and the west end of the ground-floor beneath the harness-room and granary is fitted up as a bathroom for the men, with three plunge-baths and four washhand basins, and hot and cold water led into them. The floor is laid with granolithic, and the walls are of enamelled brick. Next door is a spacious dining-room, with seats and tables, also fitted in the most approved but plain fashion, with a fireplace and Bailey's steam-kettle.

The dust-carts weigh from  $13\frac{1}{2}$  cwt. to  $14\frac{1}{2}$  cwt. net. The water-carts give a tare of 17 cwt., and they carry about 300 gallons of water, equal in weight to about 30 cwt. A new cart of this class, the Willacy van, has recently been introduced. Its tare is 21 cwt., and it takes about the same quantity of water. The method of distribution is such, however, that it effects in one journey what the other form of water-cart could only accomplish in two journeys.

#### CLASS OF HORSES WANTED IN CITIES.

Though it is not quite within the scope of the inquiry presently being followed, the views of city contractors as to the class of horses best suited for their work may be of interest. Those in England favour what is known as an Irish "Gyp" horse for heavy cart and van work, but for lorry or dray work, the heaviest class of draught-horse is desired. Shires are reported to have the greater weight, but for activity and good clean legs Clydesdales are more to be commended. Glasgow contractors prefer the Clydesdale type of horse, and those from whom replies have been received purchase chiefly in the local markets. Mr Brechin prefers a good, clean-legged horse, with strong clean bone. Mr Young, for the work of the Board of Police, expresses a preference for a horse with good heart, and well-ribbed, compactly built, standing on clean sound legs and feet, and about  $16\frac{1}{2}$  hands high. Wordie & Co., whose stud, as we have seen, is a very large one, find Clydesdales bred in the north of Scotland most suitable for their heaviest work, and Canadians for the lighter; while the other two railway firms give the preference to Clydesdales purchased in Glasgow markets, animals of a fair size, good substance, with not too much hair on their legs. One private firm of contractors finds the Irish "Gyp" horse most suitable for their work; and there cannot be a doubt that this hardy, well-built, and good-wearing horse is very suitable for much rough work in the cities. This horse gives indication of having a drop of thoroughbred blood in his veins, and his tenacity in the yoke and keen energy are doubtless in large measure due to this.

#### FARM-HORSES.

The widely separated localities from which the replies regarding farm-horses have been received, suggest the reasonable hope that representative results will be arrived at under this head. The farmers who keep horses solely for work purposes, as a rule agree with the city owners in preferring geldings, and on the same grounds. They are in general more equable in

temper, being free from the sexual desires to which mares are subject. One or two of our correspondents, however, indicate the opinion that but for this, on the score of working power, the mare is probably superior. In draught she is keener, and when put to it can display more courage and energy. One or two prefer mares, for the additional reason that when disabled for work, if not too old, they can be more profitably utilised for breeding purposes than by selling them. Mr Brown, Watten Mains, prefers mares, for the twofold reason that in his part of the country geldings sell to better advantage, and mares are handy for breeding purposes. This may be regarded as, outside of purely pedigree breeding circles, representative of the view that is prevalent over the north of Scotland. As we have seen, geldings from that quarter are popular for city work, and this is conducive to the promotion of the interests of the breeder. Geldings are sold after being broken—that is, when rising five years old; and Mr Brown parts with his mares when they reach twelve or fourteen years of age. The working horses are allowed to rest during the time of singling turnips, being turned out to grass; and young horses are put to light work when rising three years old, and after they have completed their fourth year are wrought regularly at whatever comes.

When it is necessary to buy in stock, Mr Lumsden of Nevity usually selects colts or fillies one, two, or three years old, and sometimes will sell a good horse if opportunity offers. Mr MacGregor, Fearn, buys when necessary also, but would never take a horse or mare over seven years old. If he has no young horses coming in of his own breeding, and any of his stock begin to show signs of inactivity, he weeds them out and buys in to keep up his numbers. In 1891 he cleared off five, and replaced them by three young ones bred on the farm, and two bought in. When buying he prefers a well-bred, "squat" Clydesdale, if possible from Aberdeenshire, as he finds that horses bred in that county thrive well when imported into Ross-shire. Mr MacGregor never yokes a young horse until he is three and a half years old, or carts him until he is five. This system has its advantages if one can afford to lie out of capital. The horse will be all the better matured and abler for his work under this system than when yoked too early; and when one can sell a gelding reared in this way for £100, he can afford to wait.

Mr Dickson sells the best geldings, when he can spare them, from five to eight years old; and as he endeavours to have at least two foals every season, their places are taken by young ones: and in this way the stud is kept up. Mr Glendinning does not breed horses—and this, on the whole, is a common feature on the larger Lothian and Berwickshire farms. He prefers buying his horses when two and a half years old, and

then wintering them. In the first spring they are broken to chains, and wrought lightly. They are then turned out to grass during the summer, and come in for ploughing when three and a half. They are thus gradually accustomed to full work, to which they are put when fully four and a half years old. In cases where horses are bred on these Lothian or Berwickshire farms, geldings are disposed of before they are eight years old, and when in good condition and well brought out, they sell for good prices. On all of these cropping farms, where from four to thirteen pairs of work-horses are in regular employment, there is a period of rest from the close of turnipsowing until the beginning of harvest, and during this time the horses are in turn put out to graze. But for this the work is very constant, and by no means easy, and in the case of some of our correspondents there is very heavy carting.

Mr Dickenson, Longcroft, states that coals have to be carted sixteen miles from the pit, and the railway station is fourteen miles distant, so that the horses have much heavy carting to do, and are often twelve hours and fourteen hours out of the stable at a stretch. Considering that the roads are often not of the best, this is work that will compare with the heaviest city work, and a very active class of horse is needed for it. Mr Dickenson finds horses of any breed suitable which have good action, and weigh, when fully matured, from  $14\frac{1}{2}$  cwt. to 17 cwt. in working condition. He usually purchases from dealers in the local autumn fairs, and the horses bought are, as a rule, those bred in the North of England or West of Scotland. Nothing, however, suits better for his work than a home-bred horse out of a country mare, and got by a good, big, well-bred Clydesdale horse.

#### HOURS OF LABOUR AND FEEDING.

The hours of labour in farm-studs vary. In Caithness the routine is nine hours in summer and seven hours in winter. The horses are fed in the working season between 5 and 6 A.M., from 11 to 12 mid-day, and at 8 P.M. Of course during summer, when the days are longest, they are grazing. In the Black Isle the hours are a little longer—ten hours being the standard as long as the daylight will allow. The servants yoke at 6 A.M., and unyoke at 11 A.M. for dinner. They resume at 1 P.M., and continue until 6 P.M. The horses are fed during summer at 5 A.M., 11 A.M., and 6 P.M., and at 8 P.M. additional during the season of hardest work. On Sabbaths they get one feed of corn less, except when the week's work has been harder than usual. Sometimes in the North there is a little variety in the feeding hours on Sabbath—7 A.M. being substituted for the very early

hour of 5, and noon for 11 o'clock, but otherwise all the seven days are alike in this respect.

Turning to the Lothians, we find that Mr Dickson reports the working-day as of ten hours' duration, and the feeding hours 5 A.M., 9 A.M., noon, and 6 P.M. On the rest-day, the 9 o'clock diet is omitted, and the first is later. On the other hand, with Mr Dobie, while the working-day is of the same length, the feeding hours are 5 A.M., 11.30 A.M., and 6.30 P.M., with no change on the first day of the week. This, however, does not indicate all the diversity that prevails. Mr Glendinning reports the hours of labour in winter to be from daylight to dark, and when the daylight is prolonged, from 6.30 A.M. to 11.30 A.M., and from 1 P.M. to 6 P.M. The feeding hours on week-days are 5 and 11.45 A.M., and 6.30 P.M., and on Sabbaths 5.30 A.M., 12.15 P.M., and 6 P.M.

Passing into Berwickshire, the working-day, when daylight allows, is, as elsewhere, ten hours; but the morning feeding hour from March to November is 4.45, and from November to March 6.30; mid-day meal all the year 11.30 A.M., next at 5 P.M., and the last at 8 P.M. These are the hours given by Mr Smith, Crumstane. Mr Caverhill, however, differs, although the post-town of both is Duns. The morning meal is given at 5.15, the mid-day meal at 11, and the evening meal at 6.30, and all the days of the week are alike. On the whole, this adherence to the same feeding hours on the rest-day as on the working-days is probably the best for the horses, although it would not be surprising if the men took a different view. On Mr Hewat Craw's large farm there is another system in vogue. The day is divided into two yokings of five hours each. The horses are fed from September until 1st March at 6 A.M., 12, and 6 P.M. From 1st March until midsummer they receive a fourth meal at 9 P.M., and after midsummer they are turned out to grass until harvest begins. These hours are also reported by Dr Gibb as being adhered to on his farm when the daylight is long enough to admit of it, and in the short days they work from dawn till dusk, less one and a half hour's rest in mid-time. The feeding hours are 5.15 A.M., 11.15 A.M., 6.15 P.M., and 7.45 P.M. A similar system prevails on the Messrs Dickenson's farm; but as already indicated, their horses are sometimes twelve hours and fourteen hours in the yoke, and of course in such cases they are fed by the way.

#### FEEDING OF FARM-HORSES.

This section of our paper opens up an interesting field of inquiry, and the comparison between the food given to work-horses at the severest city labour and the food given to farm-

horses on the heaviest cropping farms, should be of permanent value. The quantity of concentrated food given will probably, as a rule, be found to be greatly less on the farms than in the city studs, and we feel the contrast at the outset with the return made from Caithness.

The morning meal consists of 5 lb. bruised oats, with oat-straw *ad lib.* The same quantities of the same food are repeated at mid-day, and from ten to fourteen swedes are added. The morning meal is repeated at night, and with plenty of good straw the horse thrives very well, and does all that is wanted of him. In spring hay takes the place of the straw, and there is thus a better bite. These figures would not compare well with the 20 lb. grain of the London and Glasgow railway contractors, and Mr Brechin's potent "mashes" three times a-week; but farm labour and driving pig-iron are different tasks both for man and horse, and there would need be a difference in their sustenance. However toothsome a diet turnips may be, they are not quite the class of food necessary to sustain the strain put upon a city horse. The 5 lb. feed of oats appears to be a good average. It is quoted by Mr Lumsden, who gives it three times daily, with hay *ad lib.* These oats are unbruised, and there is some reason to believe that in that form they prove less sustaining than when bruised. The fact that those employing horses in the hardest work invariably use bruised oats, shows that in that form they are of greater value as a feeding-stuff. And the conclusion is inevitable that it would be more economical to feed with bruised oats on farms than with whole. There is much less risk of intestinal injury from horses "bolting" their oats when they are bruised, and this in many cases would alone conduce to a considerable saving. Along with the oats at mid-day Mr Lumsden feeds with six swedish turnips during winter and spring, and in spring each horse gets half a pailful of boiled barley daily. At 8 P.M. during winter about a dozen turnips are given to each horse, and this, with plenty of good hay, completes his diet for the day.

Mr MacGregor feeds with 5 lb. bruised oats four times per day. When the horses come in at night they get 3 lb. dry bran mixed with their oats, and at eight o'clock they are further supplied with a few roots. Cut hay is provided, as much as each horse can eat, so that, on the whole, the horses on this diet should be in a thriving condition, and able for heavy work. 20 lb. bruised oats, with 2 lb. bran, per day, is good feeding, and should promote both health and strength.

The feeding given to the horses in the Dailuaine-Glenlivet Distillery Company's stud differs somewhat from any we have yet brought before our readers. The horses have fairly hard work, drawing loads of about a ton over steep country roads,

and often being loaded both going and returning. In the one case the produce of the distillery forms the load, and in the other they draw loads of 1 ton of coal and 5 qrs. barley. Great attention is paid to obtaining the best quality of well-seasoned hay. Old oats are carefully stored, free from damp, and only small quantities bruised as required. The oats are damped five hours before feeding, and when any signs of costiveness appear, the quantity of bran and locust-beans given as a regular part of the food is, in a case requiring it, increased. On the other hand, when grass is in season, and given, the locust-beans and bran feeding is for the time stopped. The diet does not vary at either of the three principal meals. In the morning, at noon, and in the evening, when work is over, each horse gets a feed of bruised oats, mixed with bran, cut hay, and a few locust-beans. At 8 P.M. they each get one feed boiled barley, and further, a glassful of linseed-oil is given to each daily. The daily quantity to each horse is—bruised oats, 16 lb.; bran, 3 lb.; locust-beans, 1 lb.; boiled barley, 7 lb.; hay about 22 lb. This food *régime* has been attended with the best results. The horses are fit and able for their several tasks, and colics and other similar ailments have been unknown since this method of feeding has been adopted. The saving element in it has been found to be the addition of the locust-beans and bran to the feed of oats. This is so simple a preventive of distressing ailments to which many good horses have been sacrificed, that it is surprising that it is not in more general use.

When we come to the south and look at the feeding on the Lothian farms, a change comes over our dream. The breakfast allowance in our first report is given as 9 lb. oats, and the mid-day allowance is the same. Along with this, in the morning, during heavy spring work, each horse gets at 9 o'clock 3 lb. dough. This consists of bruised oats, the seeds being extracted, mixed with pease-meal and boiling water, and baked into a dough of the above weight. It is simply fed out of the palm of the hand, and is greedily devoured by the horses. The supper meal consists of a boiled mash of 38 lb. weight, consisting of boiled turnips, light barley or oats, and a little bran—one-half, 19 lb., given when the horses come in from work, and the remainder at 8 P.M. Formerly the whole quantity was given at once; but there has been a better state of health promoted since it was divided. Raw swedes are given, in addition to the oats, at the ordinary meals, and straw fodder *ad lib.* until spring work begins, when hay is substituted for it.

Still another variety comes before us in the answers of Mr Dobie. He feeds during the long day of summer with a daily allowance to each horse of 20 lb. bruised oats, with hay or

grass, and in the short winter day with 15 lb. bruised oats, and half a pailful of boiled turnips mixed with cut hay. This warm mash is given when the horses come in, and they eat it while being groomed. By the time this operation is over, the warm food has been consumed, and they then receive their evening portion of bruised oats. The diet at the three feeding hours to each horse is thus during summer about  $6\frac{1}{2}$  lb. bruised oats, and during winter about 5 lb. of the same. Formerly a whole pailful of boiled turnips, &c., was given to each horse when he came in; but this has been departed from, and the same quantity to each pair of horses has given a better bill of health. The hay is not given, as in some cases, *ad lib.* It is put up for the men in daily bunches of 14 lb. each, and this allowance has to be equally divided at the three diets, otherwise there is much waste of fodder. And the example of Mr Dobie in this respect well deserves to be followed.

The feeding in Mr Glendinning's stud is very systematically arranged, and again exhibits some variety. The daily allowance of hay to each horse is 18 lb.; and the morning meal on a working-day consists of 7 lb. bruised oats, the mid-day meal of 6 lb., and the evening meal of 7 lb. of the same material. On Saturdays the allowance of oats is reduced to 14 lb., and the evening meal consists of a mash, the ingredients in which are for each horse 3 lb. bruised oats, 6 lb. bran, 2 oz. rock-salt, and  $\frac{1}{2}$  oz. saltpetre. The allowance for the Sabbath is 16 lb. oats and 18 lb. hay. On this farm the practice of feeding at 8 P.M. has been discontinued, but more out of regard to the convenience of the men than to any known advantage to the health of the horses. One of the ploughmen goes through the stable between 8 and 9 P.M. to see that everything is square; but there is no feeding or grooming done at that hour.

The Crumstane management is not unlike that of the Strath-spey Distillery Company. At the morning meal each horse's portion is 8 lb. oats, and in addition one raw turnip when the roots are in season. At mid-day the same quantities and kinds of food are repeated, with the addition of one table-spoonful of spice. At five o'clock, or whenever the horses are unyoked, they get each 4 lb. dry bran and one wine-glassful of linseed-oil; and at 8 P.M. they receive a repetition of the morning and mid-day diet—8 lb. oats, and a raw turnip if in season. Along with this fodder is also given. During the short days of winter, oat-straw, not too long threshed, is found to be most useful; and in spring, when the work is harder and the full day's darg has to be performed, cut hay and straw, what is generally termed "chop," forms the staple feeding. Mr Smith testifies that he has found this treatment answer well. His horses are seldom



ill; they are always in good condition, and fit for a hard day's work, which they often get.

Mr Melville Caverhill feeds with 5 lb., the same quantity of bruised oats as several others already quoted from; and at the evening meal this is supplemented with 5 lb. unwashed raw potatoes. The fodder during the short days is cut straw, and during seed-time cut hay. Owing to an unfortunate circumstance, a change was made in the watering of the horses recently, which has not been referred to by any others of our correspondents. The custom in the district, and presumably the general custom all over Scotland, is to water the horses first in the morning on the way to the yoke. In the Crichness stud they are watered before they receive their morning allowance of oats. This change has been made on the advice of the veterinary attendant, and is likely to be generally commended by members of the profession.

For farm-horses Mr H. Hewat Craw reports the heaviest feeding with oats yet met with. The horses receive 24 lb. bruised oats per day, divided into four feeds, and along with this they get equal quantities of cut hay and straw *ad lib.* A change was some time ago made from feeding with uncut oat-straw in winter and uncut hay in spring and autumn, but the horses have been much healthier since the change was made. On an outlying farm, where hay is scarce, a splendid substitute is cultivated. There are ten horses on this farm, and for them a breadth of land is sown with the following mixture: two bushels beans, two bushels peas, and one bushel oats to the acre. This is cut when green, usually in August, and when dried is stacked. The horses show great fondness for this fodder, and thrive admirably on it.

In spite of diversity, our correspondents' answers plainly show that the feeding of farm-horses in Berwickshire is both hard and strong. Dr Gibb's horses get bruised oats four times a-day—a full feed both at 5.15 and 11.15 A.M., and half a feed when they come in from the yoke, and the remaining half at 7.45 P.M. When in season they get each two swede turnips per day, and when these are out of season a wine-glassful of linseed-oil forms a good substitute. Oat-straw chopped, and good ryegrass hay chopped, form the fodder in their respective seasons.

The weekly allowance to each horse in the Longcroft stud of twenty-four is four bushels of oats, with long straw or hay, as the case may be, *ad lib.* Turnips when in season are given along with the oats in the discretion of the driver. Each horse will probably get three or four turnips per day. No material change has been made in the system of feeding in recent years, but long ago the practice of giving boiled suppers of turnips and barley was generally followed. At that time the Messrs

Dickenson say they sustained serious losses, through their horses being attacked with inflammation of the digestive organs, and on veterinary advice, the system was departed from. The theory was that the horses were put to hard work on steep land with too much of this soft food lying undigested in their stomachs. Whatever the cause, the fact is undoubted that they have been much healthier since the change was made.

A careful examination of the figures that have now been laid before the reader will show that the feeding of farm-horses in the Lothians and Berwickshire is, as a rule, stronger and heavier than it is in the north of Scotland, and that even city contractors do not feed with more weight of grain than do farmers in the heaviest agricultural districts. The heaviest grain feeding amongst contractors who have replied is 23 lb.; and more than one of the Berwickshire farmers feeds with 24 lb. of oats during the spring season. On the other hand, city horses rarely get boiled food, or even raw roots, but the latter is quite a common article of diet with all our agricultural correspondents; and although the former is not in general use, as it once was, a small feed of boiled barley, or barley, bran, and turnips, is not uncommon. The mash of bruised oats and bran without roots, given by Mr Glendinning, seems a useful article of diet; and on the whole, the tendency even amongst farmers is plainly in the direction of a lessened diet of boiled turnips.

In the 'Transactions' for 1890, pp. 144, 145, will be found some details of the feeding of work-horses in breeding districts. The experience of farmers in the north-west and south of Scotland, where breeding forms an important feature, is in favour of feeding four times daily, with a daily allowance of from 14 to 16 lb. of grain to each animal, exclusive of fodder. There, also, the boiling of food is gradually going out of favour, and the universal practice will doubtless soon be that recommended by several of those whose experience has been quoted. One thing which impresses us, in comparing the different figures and weights and substances of our correspondents both now and two years ago, is the extent to which oats alone are in use in these great cropping areas. 15 lb. thrice repeated, 20 lb. thrice repeated, 18 lb. and 24 lb. twice repeated, are the weights of grain feeding, confined to oats alone, that we have had reported to us for this paper. Reverting to our former paper, we find that in Ayrshire, on the other hand, the morning meal consists of 3½ lb. bruised oats, 3½ lb. Indian corn, and 3 lb. chopped hay, and the same is repeated at noon. This gives 14 lb. grain in the day, but oats form only half of that weight. Again, in Aberdeenshire, the total weight of oats fed with in a day is 12 lb., the remainder of the food being in the softer form of bran. It also appears, from the figures before us, that while the total

weight of food of all kinds given to the London horses is 40 lb. per day, and the Glasgow horses 35 lb., 36 lb., 38 lb., and 34 lb., the Lothian and Berwickshire farmers feed with 38 lb., 41 lb., and 34 lb., exclusive, in some cases, of raw roots; while in one case, where there is a mash of 38 lb. given, the total weight of daily food is not less than 56 lb. per day.

Those who are desirous of testing the economical aspects of this question have now an abundance of facts placed before them; but it would obviously be impossible to arrive at any results that could be regarded as generally conclusive, or as applicable in every case or in any two districts. The fluctuating prices of grain, and the varying chemical properties of the various food-stuffs, would require to be carefully gone into; and in the end it would probably be found that the man who has to buy all his feeding-stuffs gets better value for his money than the farmer who feeds with what he grows.

#### GROOMING.

The grooming of farm-horses is not a subject on which much can be said. As a rule the custom is to wipe down, more or less thoroughly, morning and evening; but in some cases the horses are stripped at mid-day, and thoroughly groomed and rested. The curry-comb is in general use; and the morning grooming is a thorough cleaning of the skin with this, and a firm brush down with the bristles brush, and smoothed over with the dandy brush. Thrice daily is the grooming order usually followed in the North; but in the distillery stud in Strathspey the horses are groomed five times per day—viz., at 5 A.M., 11 A.M., 12.30 P.M., 6 P.M., and 8 P.M. In the South and East the mid-day grooming is not so thorough as in the North, and in some cases the principal grooming is done in the evening. Generally, however, the owners like the men to straighten out the hair at mid-day, and considerable attention is paid to horses coming in wet. They are scraped down with an iron scraper, then rubbed lightly down with a wisp of straw, and a bag or sack of some kind thrown over them. The men then go home and change themselves, and when they return subject the horses to a thorough grooming.

The result of our inquiries has been to show that in the main a great deal of watchful care and attention is bestowed on work-horses on farms. In some cases, however, rather much is left in the discretion of the men, and good firm rules in regard to the use of hay and straw, and perhaps a more extended use of the nose-bag, even on farms, would result in securing a substantial saving to the owners.

## CATTLE-FEEDING.

## LINSEED AND DECORTICATED COTTON-CAKE.

By JOHN HART, Estates Office, Cowie, Stonehaven.

THIS experiment was undertaken to determine whether linseed-cake or decorticated cotton-cake is the more economical by-fodder to use along with turnips and straw, and also to test the relative values of farmyard manure made by cattle fed on these cakes.

Of course it may be said that a solitary experiment proves little; still, as farming is a practical science, it is only by experiments, carefully conducted under proper conditions, that the truth can be reached. Speculative or fireside farming is at a discount in these days. Experiment and observation are essential, and could we only bring to bear on the various branches of the farming industry sufficient intelligence and scientific skill, there can be no doubt that our science could be much advanced, the productiveness of the land largely increased, and the British farmer made better able to withstand the flood of foreign importations poured upon our shores. I venture to think that if all qualified observers kept an accurate record of their experiments, the results would conduce to the general good. For of the agriculturist as of the student it may be said:—

“By mutual intercourse and mutual aid  
Great deeds are done, and great discoveries made;  
The wise new wisdom on the wise bestow,  
Whilst the lone thinker's thought comes slight and slow.”

It was, I believe, from a conviction of the need of accurate experiments in cattle-feeding, that Major Innes of Cowie, an enlightened and enthusiastic agriculturist, instructed me to carry out at his farm of Lumgair the following experiments.

The cattle were carefully selected for this experiment. They were six-quarter old Irish cattle, which were part of a lot of sixty brought to the farm as weaned calves in September 1888; they were taken out of a cattle-court on the 18th December 1889, and tied up in the byre after being weighed, and were fed on turnips and straw *ad libitum*. They were again weighed on the 15th January 1890, when they were selected and classed into three lots—six being put on linseed-cake, the same number put on decorticated cotton-cake, the amount of cake given being 1 lb. per head per day, and three

were continued on turnips and straw without getting any dry-fodder.

The following table shows the weight of the bullocks when tied up, and again on the 15th January 1890—i.e., after being tied up twenty-eight days:—

*Linseed-cake Lot.*

No.	Dec. 18, 1889.	Jan. 15, 1890.	Increase.
	lb.	lb.	lb.
32 . . .	928	964	36
31 . . .	952	986	34
29 . . .	1008	1056	48
38 . . .	1004	1050	46
25 . . .	1069	1096	27
30 . . .	1042	1084	42
Total increase . . . . .			233
Average . . . . .			<u>38½</u>

*Decorticated Cotton-cake Lot.*

No.	Dec. 18, 1889.	Jan. 15, 1890.	Increase.
	lb.	lb.	lb.
28 . . .	1120	1152	32
35 . . .	1028	1052	24
33 . . .	980	1020	40
36 . . .	1022	1052	30
27 . . .	1026	1068	42
37 . . .	985	1008	23
Total increase . . . . .			191
Average . . . . .			<u>31½</u>

*Turnips and Straw Lot.*

No.	Dec. 18, 1889.	Jan. 15, 1890.	Increase.
	lb.	lb.	lb.
20 . . .	980	1012	32
23 . . .	956	996	40
24 . . .	952	988	36
Total increase . . . . .			108
Average . . . . .			<u>36</u>

From the above table it will be seen that the linseed-cake-fed lot made an average gain of 38½ lb. The decorticated-cotton-cake-fed lot an average gain of 31½ lb., and the turnips-and-straw-fed lot an average gain of 36 lb. for four weeks, so that the linseed-cake lot and the turnips and straw lot increased more during the probationary period than the decorticated cotton-cake lot. This must be kept in mind in estimating the result of the experiment.

On the 15th January the cake-fed lots were put on an allowance of 1 lb. of cake per head per day in addition to turnips and straw, and were continued on this amount till the 19th February, at which date they weighed as under:—

*Linseed-cake Lot.*

No.			Weight. lb.	Increase. lb.
32	.	.	1026	62
31	.	.	1078	92
29	.	.	1132	76
38	.	.	1124	74
25	.	.	1164	68
30	.	.	1154	70
Total increase				442
Average				<u>73<math>\frac{1}{2}</math></u>

*Decorticated Cotton-cake Lot.*

No.			Weight. lb.	Increase. lb.
28	.	.	1236	84
35	.	.	1112	60
33	.	.	1120	100
36	.	.	1140	88
27	.	.	1184	116
37	.	.	1090	82
Total increase				530
Average				<u>88<math>\frac{2}{3}</math></u>

*Turnips and Straw Lot.*

No.			Weight. lb.	Increase. lb.
20	.	.	1064	52
23	.	.	1042	46
24	.	.	1018	30
Total increase				128
Average				<u>42<math>\frac{2}{3}</math></u>

Showing that the linseed-cake-fed lot gained on an average 73 $\frac{1}{2}$  lb., the decorticated-cotton-cake-fed lot 88 $\frac{2}{3}$  lb., and the turnips-and-straw-fed lot 42 $\frac{2}{3}$  lb.—this showing a gain of 45 $\frac{1}{2}$  lb. in favour of the decorticated-cotton-cake-fed lot, while the linseed-cake-fed lot had 31 lb. to their credit against the turnips-and-straw-fed lot.

The average temperature in the byres during that period was 51 $\frac{1}{2}$ ° Fahr.

On the 20th February the amount of cake was increased to each of the cake-fed lots to 2 lb. per head per day, and they

were continued on this allowance till the 12th March, when they were again weighed, with the following results:—

*Linseed-cake Lot.*

No.				Weight. lb.	Increase. lb.
32	.	.	.	1072	46
31	.	.	.	1138	60
29	.	.	.	1192	60
38	.	.	.	1168	44
25	.	.	.	1216	52
30	.	.	.	1220	66
Total increase				.	328
Average				.	<u>54<math>\frac{1}{2}</math></u>

*Decorticated Cotton-cake Lot.*

No.				Weight. lb.	Increase. lb.
28	.	.	.	1304	68
35	.	.	.	1154	42
33	.	.	.	1162	42
36	.	.	.	1180	40
27	.	.	.	1220	36
37	.	.	.	1156	66
Total increase				.	294
Average				.	<u>49</u>

*Turnips and Straw Lot.*

No.				Weight. lb.	Increase. lb.
20	.	.	.	1104	40
23	.	.	.	1068	26
24	.	.	.	1050	32
Total increase				.	98
Average				.	<u>32<math>\frac{1}{3}</math></u>

Showing a gain of 22 lb. per head in favour of the linseed-cake-fed lot, a gain of 16 $\frac{1}{2}$  lb. per head for the decorticated-cotton-cake-fed lot, over the turnips-and-straw-fed lot.

The average temperature in the byres during that period was 50° Fahr. The temperature of the byres was very unsteady—it ranged from 41° to 62° Fahr.—and during the colder days the linseed-cake-fed lot seemed to have considerably the best of it.

On the 13th March the allowance of cake was increased to 3 lb. per head per day, and this was continued till the 26th March, when they were again weighed, with the following result:—

*Linseed-cake Lot.*

No.		Weight. lb.	Increase. lb.
32	.	1102	30
31	.	1176	38
29	.	1216	24
38	.	1202	34
25	.	1260	44
30	.	1246	26
Total increase			196
Average			32 $\frac{1}{2}$

*Decorticated Cotton-cake Lot.*

No.		Weight. lb.	Increase. lb.
28	.	1332	28
35	.	1184	30
33	.	1194	32
36	.	1210	30
27	.	1266	46
37	.	1190	34
Total increase			200
Average			33 $\frac{2}{3}$

*Turnips and Straw Lot.*

No.		Weight. lb.	Increase. lb.
20	.	1124	20
23	.	1088	20
24	.	1072	22
Total increase			62
Average			20 $\frac{1}{3}$

Showing a gain for the linseed-cake-fed lot of 12 lb. per head, and for the decorticated-cotton-cake-fed lot 12 $\frac{2}{3}$  lb., over the turnips-and-straw-fed lot.

The average temperature in the byre during this period was 55° Fahr.

On the 27th March the allowance of cake was increased to 4 lb. per head per day, and this was continued till the 9th April, when they were again weighed, with the following result:—

*Linseed-cake Lot.*

No.		Weight. lb.	Increase. lb.
32	.	1120	18
31	.	1230	54
29	.	1252	36
38	.	1232	30



*Linseed-cake Lot—continued.*

No.		Weight. lb.	Increase. lb.
25	. . . .	1280	20
30	. . . .	1268	22
Total increase			180
Average			30

*Decorticated Cotton-cake Lot.*

No.		Weight. lb.	Increase. lb.
28	. . . .	1372	40
35	. . . .	1208	24
33	. . . .	1228	34
36	. . . .	1250	40
27	. . . .	1302	36
37	. . . .	1208	18
Total increase			192
Average			32

*Turnips and Straw Lot.*

No.		Weight. lb.	Increase. lb.
20	. . . .	1140	16
23	. . . .	1108	20
24	. . . .	1084	12
Total increase			48
Average			16

This shows a gain of 14 lb. per head for the linseed-cake-fed lot, and a gain of 16 lb. per head for the decorticated-cotton-cake-fed lot, over the turnips-and-straw-fed lot.

The average temperature of the byres during this period was 55½° Fahr.

On the 10th April the allowance of cake was increased to 5½ lb. per head per day, and this amount was continued till the 23d April, when they were again weighed, with the following result:—

*Linseed-cake Lot.*

No.		Weight. lb.	Increase. lb.
32	. . . .	1144	24
31	. . . .	1260	30
29	. . . .	1284	32
38	. . . .	1268	36
25	. . . .	1316	36
30	. . . .	1302	34
Total increase			192
Average			32

*Decorticated Cotton-cake Lot.*

No.		Weight. lb.	Increase. lb.
28	. . . .	1414	42
35	. . . .	1236	28
33	. . . .	1257	29
36	. . . .	1284	34
27	. . . .	1324	22
37	. . . .	1236	28
Total increase			<u>183</u>
Average			<u>30<math>\frac{2}{3}</math></u>

*Turnips and Straw Lot.*

No.		Weight. lb.	Increase. lb.
20	. . . .	1180	40
23	. . . .	1132	24
24	. . . .	1108	24
Total increase			<u>88</u>
Average			<u>29<math>\frac{1}{3}</math></u>

This shows a gain of 2 $\frac{2}{3}$  lb. per head for the linseed-cake-fed lot, and a gain of 1 lb. per head for the decorticated-cotton-cake-fed lot, over the turnips-and-straw-fed lot.

The temperature in the byre during this period averaged 55° Fahr.

From the 23d April to the time the cattle were killed, they were continued on an allowance of 7 lb. of cake per head per day, and on the 21st May the cattle were again weighed, with the following result:—

*Linseed-cake Lot.*

No.		Weight. lb.	Increase. lb.
32	. . . .	1226	82
31	. . . .	1348	88
29	. . . .	1360	76
38	. . . .	1356	88
25	. . . .	1400	84
30	. . . .	1364	62
Total increase			<u>480</u>
Average			<u>80</u>

*Decorticated Cotton-cake Lot.*

No.				Weight. lb.	Increase. lb.
28	.	.	.	1459	45
35	.	.	.	1280	44
33	.	.	.	1333	76
36	.	.	.	1360	76
27	.	.	.	1412	88
37	.	.	.	1297	61
Total increase				.	390
Average				.	65

*Turnips and Straw Lot.*

No.				Weight. lb.	Increase. lb.
20	.	.	.	1244	64
23	.	.	.	1198	66
24	.	.	.	1152	44
Total increase				.	174
Average				.	58

The above shows a gain of 22 lb. per head in favour of the linseed-cake-fed lot, and a gain of 7 lb. per head for the decorticated-cotton-cake-fed lot, over the turnips-and-straw-fed lot.

The average temperature in the byres for this period was  $60\frac{1}{2}^{\circ}$  Fahr.

On this day (21st May) the feeding experiment was practically ended. Major Innes invited his tenantry and farmers in the district to see the result of the feeding experiment. A large number of farmers accepted the invitation. The details of the experiment were explained, the cattle were brought out one by one, all present were given an opportunity to handle them. Slips of paper were given to each farmer, to put down his estimate of the dead-weight of each bullock (what is now known as a "block test"), and, as will be seen from the sub-joined table, there was considerable diversity of opinion as to the weights. As the bullocks were not killed till a few days after, an allowance, corresponding to the length of time the cattle were kept before being slaughtered, would require to be made to the estimated weight given in by the farmers. Thirty-two farmers handed in slips, with what they considered the dead-weight of each bullock marked on it; and I have numbered them in the order in which they were given in.

## LINSEED-CAKE LOT.

No. of Slip.	32	31	29	38	25	30	TOTAL.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
1	5 2 0	6 2 0	7 0 0	6 2 0	7 0 0	6 3 0	39 1 0
2	5 3 0	6 3 0	6 3 0	7 0 0	7 0 0	6 3 0	40 0 0
3	5 1 0	7 0 0	7 0 0	7 1 0	7 0 0	6 2 0	40 0 0
4	7 0 0	7 2 0	7 2 0	7 0 0	7 3 0	6 2 0	43 1 0
5	5 3 0	7 0 0	6 3 0	7 2 0	7 3 0	7 0 0	41 3 0
6	5 3 0	6 2 0	7 0 0	7 0 0	7 2 0	6 3 0	40 2 0
7	5 3 16	6 3 14	7 0 0	6 3 14	7 1 0	6 3 0	40 2 16
8	6 0 0	7 0 0	7 1 0	7 0 0	7 2 0	6 3 0	41 2 0
9	6 0 0	7 0 0	6 3 0	7 0 0	7 1 0	6 3 0	40 3 0
10	5 3 0	6 2 0	7 0 0	7 1 0	7 2 0	7 3 0	41 3 0
11	6 1 0	6 2 0	6 3 0	6 1 0	6 3 0	6 2 0	39 0 0
12	5 2 0	6 3 0	7 0 0	6 1 0	7 0 0	7 3 0	40 1 0
13	6 2 0	7 0 0	7 2 0	7 2 14	8 0 0	7 2 14	44 1 0
14	5 2 0	6 3 0	7 2 0	7 0 0	7 3 0	7 1 0	41 3 0
15	6 1 0	6 2 0	7 2 0	5 3 0	7 2 0	6 3 0	40 1 0
16	6 0 0	6 2 0	7 0 0	6 1 10	7 1 0	7 2 0	40 2 10
17	6 1 0	6 2 0	6 2 0	6 1 0	7 2 0	7 1 0	40 1 0
18	6 1 0	7 0 0	7 1 0	6 2 0	7 1 0	7 1 0	41 2 0
19	6 1 0	6 3 0	7 0 0	6 2 0	7 1 0	6 3 0	40 2 0
20	6 0 0	7 0 0	6 2 0	6 0 0	7 2 0	6 2 0	39 2 0
21	5 3 0	6 1 0	7 0 0	6 3 0	6 3 0	6 1 0	38 3 0
22	6 2 0	7 2 0	7 2 0	7 1 0	7 3 0	7 1 0	43 3 0
23	5 3 0	6 0 0	7 0 0	5 3 0	7 1 0	7 0 0	38 3 0
24	5 3 0	6 2 0	7 0 0	6 2 0	7 1 0	7 0 0	40 0 0
25	6 0 0	6 1 14	6 2 0	6 1 14	7 0 0	6 3 0	45 0 0
26	6 0 14	6 2 0	6 3 14	6 2 14	7 1 14	6 3 14	40 1 14
27	6 1 0	6 3 0	6 3 0	6 2 0	6 3 0	6 3 0	39 3 0
28	6 0 0	7 0 0	7 1 0	6 2 0	7 1 0	6 2 0	40 2 0
29	6 0 0	7 0 0	7 1 0	7 1 0	7 3 0	6 1 0	41 2 0
30	6 0 0	7 0 0	6 3 0	6 1 0	7 2 0	6 3 0	40 2 0
31	5 3 0	6 3 0	6 3 0	7 3 0	6 1 0	6 3 0	40 0 0
32	6 1 0	7 0 0	6 3 0	...	...	...	...

## DECORTICATED COTTON-CAKE LOT.

No. of Slip.	28	35	33	36	27	37	TOTAL.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
1	7 2 0	6 0 0	...	6 2 0	7 0 0	6 2 0	...
2	7 0 0	6 0 0	6 3 0	5 3 8	6 0 0	6 1 0	37 3 8
3	7 2 0	...	...	...	7 1 0	6 1 0	...
4	8 0 0	6 1 0	7 1 0	7 1 0	7 2 0	6 2 0	42 3 0
5	7 3 0	6 2 0	7 1 0	6 1 0	6 3 0	6 1 0	40 3 0
6	7 3 0	6 3 0	6 3 0	7 0 0	7 1 0	6 3 0	42 1 0
7	7 2 0	6 0 0	6 1 0	6 2 0	7 0 0	6 2 0	39 3 0
8	7 2 0	6 2 0	7 3 0	6 2 0	7 0 0	6 1 0	41 2 0
9	7 1 0	6 1 0	6 2 0	6 1 0	6 2 0	6 3 0	39 2 0
10	8 0 0	6 0 0	6 1 0	6 2 0	7 1 0	6 1 0	40 1 0
11	7 1 0	6 1 0	6 3 0	6 1 0	7 0 0	6 2 0	40 0 0
12	7 2 0	6 2 0	6 1 0	6 0 0	7 0 0	6 1 0	39 2 0
13	8 0 0	6 2 14	7 1 14	7 0 0	7 2 14	6 3 14	43 2 0
14	8 1 0	6 3 0	7 3 0	6 2 0	7 2 0	6 3 0	43 2 0
15	7 3 0	6 1 0	6 2 0	6 2 0	7 0 0	6 0 0	40 0 0

## DECORTICATED COTTON-CAKE LOT—continued.

No. of Slip.	28	35	33	36	27	37	TOTAL.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
16	7 1 0	6 3 0	6 2 0	6 2 0	6 1 0	6 1 0	39 2 0
17	7 3 0	6 0 0	6 1 0	6 0 0	6 3 0	6 1 0	39 0 0
18	7 2 0	6 0 14	6 3 0	6 2 0	6 3 0	6 2 0	40 0 14
19	7 2 0	6 1 0	6 3 0	6 2 0	7 1 0	6 1 0	40 2 0
20	7 0 0	6 2 0	6 3 0	6 0 0	6 2 0	6 1 0	39 0 0
21	7 2 0	6 1 0	6 2 0	6 1 0	6 2 0	6 2 0	39 2 0
22	7 2 0	5 3 0	6 3 0	6 2 0	7 0 0	6 1 0	39 3 0
23	7 3 0	6 1 0	6 3 0	6 1 0	6 2 0	6 1 0	39 3 0
24	7 1 0	6 0 0	6 3 0	6 2 0	6 2 0	6 1 0	39 1 0
25	7 1 14	6 0 0	6 2 0	6 2 14	6 3 14	5 3 0	39 0 14
26	7 2 0	6 1 0	6 3 0	6 2 0	6 2 14	6 2 0	40 0 14
27	7 1 0	6 2 0	6 3 0	6 3 0	6 2 0	6 2 0	40 1 0
28	7 0 0	6 1 0	6 2 0	6 1 0	7 0 0	6 1 0	39 1 0
29	7 2 0	6 0 0	6 2 0	6 2 0	6 3 0	6 2 0	39 3 0
30	7 3 0	5 3 0	6 2 0	6 2 0	6 3 0	6 2 0	39 3 0
31	6 2 0	7 1 0	6 3 0	6 2 0	6 3 0	6 3 0	40 2 0
32	7 0 0	6 3 0	6 2 0	...	...	...	...

## RESULT OF "BLOCK TEST."

No. of Slip.	Total Weight of Linseed-cake Lot.	Total Weight of Decorticated Cotton-cake Lot.	No. 20 only, Turnip and Straw Lot.	TOTAL.
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.
1	39 1 0	...	5 2 0	...
2	40 0 0	37 3 8	5 2 0	83 1 8
3	40 0 0	...	...	...
4	43 1 0	42 3 0	5 2 0	91 2 0
5	41 3 0	40 3 0	6 0 0	88 2 0
6	40 2 0	42 1 0	6 1 0	89 0 0
7	40 2 16	39 3 0	5 2 0	85 3 16
8	41 2 0	41 2 0	5 2 0	88 2 0
9	40 3 0	39 2 0	5 3 0	86 0 0
10	41 3 0	40 1 0	5 2 0	87 2 0
11	39 0 0	40 0 0	6 0 0	85 0 0
12	40 1 0	39 2 0	5 3 0	85 2 0
13	44 1 0	43 2 0	6 1 0	94 0 0
14	41 3 0	43 2 0	6 0 0	91 1 0
15	40 1 0	40 0 0	5 3 0	86 0 0
16	40 2 10	39 2 0	5 2 0	85 2 10
17	40 1 0	39 0 0	5 3 0	85 0 0
18	41 2 0	40 0 14	6 1 0	87 3 14
19	40 2 0	40 2 0	6 0 0	87 0 0
20	39 2 0	39 0 0	5 2 0	84 0 0
21	38 3 0	39 2 0	5 2 0	83 3 0
22	43 3 0	39 3 0	5 3 0	89 1 0
23	38 3 0	39 3 0	5 3 0	84 1 0
24	40 0 0	39 1 0	5 3 0	85 0 0
25	45 0 0	39 0 14	5 2 0	89 2 14
26	40 1 14	40 0 14	5 3 0	86 1 0
27	39 3 0	40 1 0	5 3 0	85 3 0
28	40 2 0	39 1 0	6 0 0	85 3 0
29	41 2 0	39 3 0	5 1 0	86 2 0
30	40 2 0	39 3 0	5 3 0	86 0 0
31	40 0 0	40 2 0	...	...

From the above table it will be seen that the total of slip No. 22—89 cwt. 1 qr.—is the nearest to the actual total dead-weight of the three lots, which, after they were slaughtered, was ascertained to be 89 cwt. 18 lb. Then come slips No. 6, 89 cwt.; No. 25, 89 cwt. 2 qr. 14 lb.; No. 8, 88 cwt. 1 qr.; No. 5, 88 cwt. 2 qr.; No. 6, 87 cwt. 3 qr. 14 lb.

Six bullocks, Nos. 32, 31, 29, 28, 35, and 33, were weighed immediately after being fed, and were sent into Aberdeen on the 26th, killed on the 27th, and weighed on the 28th May. The following are the details. I also took the girth and length of the cattle, and their weights, according to the usual rule, without adding anything for extra finish, are given below:—

	No.	May 26. Live-weight.	May 28. Dead-weight.	Percentage of dead meat.	Weight by measure.
		cwt. qr. lb.	cwt. qr. lb.		cwt. qr. lb.
Linseed-cake . .	32	11 0 8	5 3 25	53.95	6 0 11
	31	12 0 20	6 3 24	57.18	6 3 7
	29	12 1 0	7 0 1	57.21	6 3 7
Decorticated cot- ton-cake . .	28	13 0 16	7 2 4	57.33	7 1 7
	35	11 2 0	6 2 11	57.37	6 2 21
	33	11 3 20	6 2 21	56.6	6 2 20

Nos. 38, 25, 30, 36, 27, and 37 and 20 were weighed after being fed, and were sent into Aberdeen on the 2d, killed on the 3d, and weighed on the 4th June. The details are given below:—

	No.	June 2. Live-weight.	June 4. Dead-weight.	Percentage of dead meat.	Weight by measure.
		cwt. qr. lb.	cwt. qr. lb.		cwt. qr. lb.
Linseed-cake . .	38	12 2 0	6 3 19	55.35	7 0 15
	25	12 3 0	7 0 26	56.72	7 1 16
	30	12 1 16	7 0 15	57.56	6 3 20
Decorticated cot- ton-cake . .	36	12 0 22	7 0 6	57.83	6 2 17
	27	12 3 16	7 0 24	55.95	7 1 1
	37	11 3 4	6 2 25	57.4	6 2 12
Turnips and straw	20	12 1 2	6 0 13	49.85	6 1 18

Only one of the bullocks that were fed on turnips and straw alone was killed, as they were not considered ready for the market; the other two were turned out to the pastures.

The cakes used were well suited for experiment—the linseed-cake being very rich in oil, and the decorticated cotton-cake

being very rich in albumen. The following is the composition of the cakes as analysed by Dr Aitken:—

	Linseed-cake.	Decorticated Cotton-cake.
Albuminoid compounds . . . . .	25.56	47.25
Oil . . . . .	13.92	10.18
Mucilage, sugar, &c. . . . .	34.75	24.05
Woody fibre . . . . .	5.75	3.80
Moisture . . . . .	13.80	8.70
Ash . . . . .	6.22	6.02
	100.00	100.00
Nitrogen . . . . .	4.09	7.56

The decorticated cotton-cake was very hard. Samples of the solid excrement of the cattle were taken during each of the periods, to see what proportion, if any, of the cakes was undigested, and generally what effect the various quantities of cake had on the solid excrement. The samples were analysed by Dr Aitken. The following table shows the results:—

TABLE OF ANALYSIS OF SOLID EXCREMENT.

*Dry Matter.*

Lot.		True Albumen.	Amides.	Oil.	Carbo-hydrates.	Woody Fibre.	Ash.
1	Linseed-cake . . . . .	11.81	1.50	2.05	41.77	21.47	21.40
2	Decorticated cotton-cake . . . . .	14.00	2.84	1.83	41.17	18.23	21.93
3	Turnips and straw . . . . .	11.37	3.03	2.47	40.52	21.54	21.07
<i>March 7.</i>							
1	Linseed-cake . . . . .	12.69	1.97	1.57	41.52	21.51	20.74
2	Decorticated cotton-cake . . . . .	15.75	4.16	2.62	36.53	16.71	24.23
3	Turnips and straw . . . . .	14.87	2.63	2.98	40.61	18.92	19.99
<i>March 29.</i>							
1	Linseed-cake . . . . .	14.66	2.62	2.91	40.50	17.28	22.03
2	Decorticated cotton-cake . . . . .	16.19	3.27	2.25	38.20	17.14	22.95
3	Turnips and straw . . . . .	13.12	3.50	2.01	35.33	21.06	24.98
<i>April 10.</i>							
1	Linseed-cake . . . . .	9.62	4.50	2.78	43.93	20.53	18.64
2	Decorticated cotton-cake . . . . .	13.31	8.56	2.39	38.63	16.09	21.02
3	Turnips and straw . . . . .	12.69	5.03	1.30	39.84	16.34	24.80
<i>April 23.</i>							
1	Linseed-cake . . . . .	12.91	2.84	2.61	46.91	14.63	20.10
2	Decorticated cotton-cake . . . . .	17.06	3.94	1.59	40.72	12.74	23.95
3	Turnips and straw . . . . .	12.03	3.72	1.02	46.77	14.71	21.75
<i>May 8.</i>							
1	Linseed-cake . . . . .	17.06	1.97	2.02	39.37	13.22	26.36
2	Decorticated cotton-cake . . . . .	22.31	3.18	.79	36.02	10.80	26.80
3	Turnips and straw . . . . .	12.25	2.84	.47	39.66	13.52	31.26

From the table of weights it will be observed that all the cattle increased at a very high rate towards the end of the experiment. And with reference to this, it has to be explained that the turnips grown on the farm were finished about the end of April, and the cattle were then put on other turnips of extra good quality, and mostly grown on Mains of Cowie. The temperature in the byres was also much in their favour from the 9th April to the end of the experiment: the average temperature in the byres was 60° Fahr.

In estimating the results of this experiment it is necessary to keep in mind that the linseed-cake-fed lot and the turnips-and-straw-fed lot had an advantage over the decorticated-cotton-cake-fed lot during the probationary period of 7 lb. and 4½ lb. per head respectively, and if we credit this during the experiment, we would require to deduct 76½ lb. from the total increase of the linseed-cake-fed lot, and to add 112½ lb. to the total live-weight increase of the decorticated-cotton-cake-fed lot. This would bring out for the linseed-cake-fed lot a total increase in live-weight of 1741½ lb., and for the decorticated-cotton-cake-fed lot a total increase in live-weight of 1901½ lb., against an increase in live-weight of 1196 lb. for the turnips-and-straw-fed lot (that is to say, after doubling their increase, there being only three cattle fed on the turnips and straw alone), so that the linseed-cake-fed lot increased 545½ lb. live-weight more than the turnips-and-straw-fed lot, at a cost of £10, 1s. for cake, and the decorticated-cotton-cake-fed lot increased 705½ lb. live-weight more than the turnips-and-straw-fed lot, at a cost of £8, 5s. The amount of cake consumed by each of the cake-fed lots was 448 lb. per head, equal to 2688 lb. for each lot: the linseed-cake cost £8, 7s. 6d. per ton, and the decorticated cotton-cake cost £6, 7s. 6d. per ton.

It will be observed, from a reference to the table in which the live-weights are given, during the experiment that the cattle fed on decorticated cotton-cake had considerably the best of it during the earlier stages of the experiment; but after the cattle got to a certain stage in the feeding, that the linseed-cake-fed lot had the best of it, from which two inferences might be drawn,—first, that the decorticated cotton-cake is a more suitable fodder for giving to cattle in the earlier stages of the feeding, and that after cattle are beginning to ripen linseed-cake is the more effective; and, secondly, that linseed-cake being richer in oil keeps the animals in better heat. For there can be no doubt that temperature has much to do with feeding. Anyhow, the cattle fed on linseed-cake did not seem to feel the influence of the cold weather to such an extent as those cattle which were being fed on decorticated cotton-cake, and it is well to remember here that the linseed-cake was exceptionally rich in oil. The



change of the temperature in the byres seemed to have a considerable effect on the progress which the cattle made, and I should not be surprised to find that it would pay the farmer to heat the byres by artificial means.

*Composition of Farmyard Manure made by the three lots of Cattle, when eating 4 lb. of cake per head per day.*

	Linseed-cake.	Decorticated Cotton-cake.	No cake.
	Lot 1.	Lot 2.	Lot 3.
Moisture . . .	80.44	77.35	82.85
Organic matter . .	14.41	16.61	12.41
Phosphoric acid . .	.43	.76	.32
Potash . . .	.42	.47	.26
Nitrogen, ammonia .	.44	.60	.37

To test the relative value of farmyard manure made by cattle fed on these cakes, two experiments were carried out in different fields with farmyard manure made by these cattle, when they were getting an allowance of 4 lb. of cake per head per day, one on a strong loam with a clay subsoil, and the other on a light loam with a gravelly subsoil: one plot in each experiment was treated with farmyard manure made by the linseed-cake lot, another by the decorticated cotton-cake lot, the amount of dung applied was at the rate of 27 tons per acre, and another by the turnips and straw lot; samples of the soil and subsoil were taken from each of the plots as well as from the ends of each plot where no farmyard manure was applied, in February 1891, after the turnip crop had been lifted, and were analysed by Dr Aitken. The following table shows the percentage of nitrogen contained in each of the samples submitted for analysis:—

S.=soil; SS.=subsoil; E.=end of plot; N.D.=no dung or manure.

Linseed-cake plot—				O. Field.	High-lea Field.
S.	.	.	.	.238	.294
SS.	.	.	.	.035	.077
E. S. N.D.	.	.	.	.224	.258
E. SS. N.D.	.	.	.	.056	.084
Decorticated cotton-cake plot—					
S.	.	.	.	.266	.280
SS.	.	.	.	.035	.035
E. S. N.D.	.	.	.	.238	.238
E. SS. N.D.	.	.	.	.035	.035
Turnip and straw plot—					
S.	.	.	.	.225	.259
SS.	.	.	.	.056	.056
E. S. N.D.	.	.	.	.216	.258
E. SS. N.D.	.	.	.	.156	.056

The following table shows the weight per acre of the turnips grown on the different plots:—

	Linseed-cake.			Decorticated Cotton-cake.			Turnips and Straw.		
	cwt.	qr.	lb.	cwt.	qr.	lb.	cwt.	qr.	lb.
Light loam .	354	1	4	372	3	12	344	1	4
Strong loam .	390	0	0	397	2	0	385	0	0

In 1891 the plots were sown out with barley and grass seeds in the strong loam field: the following table shows the weight per acre of the grain and straw grown in this field:—

	Barley.			Straw.		
	lb.			lb.		
Linseed-cake . . .	3097	$\frac{3}{5}$		3291	$\frac{1}{5}$	
Decorticated cotton-cake . . .	3484	$\frac{4}{5}$		3291	$\frac{1}{5}$	
Turnips and straw . . .	2420			2516	$\frac{3}{5}$	

The estimated total gain by the use of these cakes would be as under:—

1. The increased weight of the cattle fed on these cakes over the turnips-and-straw-fed lot.

2. The increased weight per acre of the turnips grown with farmyard manure made by these cattle which were receiving an allowance of cake.

3. The increased weight of grain and straw per acre grown on the plots treated with the farmyard manure made by cattle fed on these cakes.

In conclusion, I desire to take this opportunity of thanking Dr Aitken for the great assistance and never-failing kindness he extended to us during this experiment: he took no end of trouble in analysing a great number of samples, and assisted us in every way in his power in order to make the experiment reliable.



TABLE No. 2.—ESTIMATED TOTAL PRODUCE OF WHEAT, BARLEY, AND OATS IN 1891, ACREAGE AND ESTIMATED AVERAGE YIELD PER ACRE, ESTIMATED ORDINARY AVERAGE YIELD, AND ESTIMATED YIELD PER ACRE IN 1890 AND 1889, IN EACH OF THE COUNTIES OF SCOTLAND.

COUNTIES.	WHEAT.					BARLEY, INCLUDING BEER.					OATS.					
	Total Produce in 1891.	Acres in 1891.	Average Yield per Acre.			Total Produce in 1891.	Acres in 1891.	Average Yield per Acre.			Total Produce in 1891.	Acres in 1891.	Average Yield per Acre.			
			1891.	Ordinary.*	1890.			1891.	Ordinary.*	1890.			1891.	Ordinary.*	1890.	1891.
Aberdeen	Bush. 130	Acres. 5	Bush. 26.00	Bush. 36.92	Bush. 38.72	Bush. 549,034	17,242	Bush. 31.84	Bush. 62.41	Bush. 62.62	Bush. 33.53	Bush. 33.05	Bush. 33.78			
Argyle	392	14	Bush. 28.00	Bush. 31.89	Bush. 42.04	43,803	1,682	Bush. 30.70	Bush. 57.52	Bush. 58.20	Bush. 31.27	Bush. 32.98	Bush. 33.00			
Ayr	74,711	1,020	Bush. 35.73	Bush. 35.73	Bush. 42.04	64,881	1,682	Bush. 30.70	Bush. 57.52	Bush. 58.20	Bush. 31.27	Bush. 32.98	Bush. 33.00			
Banff	1,340	50	Bush. 35.73	Bush. 35.73	Bush. 42.04	261,437	8,482	Bush. 30.70	Bush. 57.52	Bush. 58.20	Bush. 31.27	Bush. 32.98	Bush. 33.00			
Berwick	108,441	3,135	Bush. 35.73	Bush. 35.73	Bush. 42.04	646,069	19,585	Bush. 30.70	Bush. 57.52	Bush. 58.20	Bush. 31.27	Bush. 32.98	Bush. 33.00			
Bute	..	..	Bush. 35.73	Bush. 35.73	Bush. 42.04	3,277	93	Bush. 35.73	Bush. 35.73	Bush. 42.04	Bush. 32.74	Bush. 32.74	Bush. 32.74			
Caithness	10	1	Bush. 10.00	Bush. 21.14	Bush. 25.00	34,726	1,121	Bush. 30.68	Bush. 30.68	Bush. 34.45	Bush. 30.68	Bush. 30.68	Bush. 30.68			
Clackmannan	12,286	351	Bush. 35.00	Bush. 36.46	Bush. 37.34	10,902	627	Bush. 37.76	Bush. 33.60	Bush. 37.61	Bush. 34.70	Bush. 34.70	Bush. 34.70			
Dumfries	81,026	788	Bush. 39.37	Bush. 30.72	Bush. 40.20	10,385	210	Bush. 30.94	Bush. 33.21	Bush. 33.65	Bush. 30.94	Bush. 30.94	Bush. 30.94			
Dumfries	1,288	80	Bush. 34.59	Bush. 33.66	Bush. 34.59	25,805	773	Bush. 32.83	Bush. 33.16	Bush. 33.65	Bush. 32.83	Bush. 32.83	Bush. 32.83			
Edinburgh	151,251	9,378	Bush. 44.78	Bush. 30.71	Bush. 41.46	278,002	6,522	Bush. 42.63	Bush. 39.16	Bush. 48.10	Bush. 42.63	Bush. 42.63	Bush. 42.63			
Elgin or Moray	59,011	1,893	Bush. 31.49	Bush. 30.09	Bush. 30.85	452,704	13,994	Bush. 32.85	Bush. 35.48	Bush. 40.73	Bush. 32.85	Bush. 32.85	Bush. 32.85			
Fife	397,396	9,715	Bush. 83.70	Bush. 30.10	Bush. 33.61	845,513	24,829	Bush. 34.06	Bush. 34.06	Bush. 40.73	Bush. 34.06	Bush. 34.06	Bush. 34.06			
Forfar	802,023	8,437	Bush. 35.88	Bush. 33.45	Bush. 38.88	32,612	28,568	Bush. 36.13	Bush. 40.04	Bush. 42.63	Bush. 36.13	Bush. 36.13	Bush. 36.13			
Glasgow	235,058	6,034	Bush. 88.96	Bush. 35.16	Bush. 38.61	590,742	14,944	Bush. 30.22	Bush. 32.10	Bush. 35.67	Bush. 30.22	Bush. 30.22	Bush. 30.22			
Inverness	2,649	65	Bush. 40.71	Bush. 29.00	Bush. 37.60	295,598	7,587	Bush. 35.80	Bush. 32.10	Bush. 35.67	Bush. 35.80	Bush. 35.80	Bush. 35.80			
Kinross	18,764	537	Bush. 84.94	Bush. 34.12	Bush. 38.60	378,501	11,168	Bush. 35.80	Bush. 32.10	Bush. 35.67	Bush. 35.80	Bush. 35.80	Bush. 35.80			
Kirkcudbright	300	10	Bush. 29.00	Bush. 28.85	Bush. 29.00	16,014	443	Bush. 32.04	Bush. 32.04	Bush. 34.47	Bush. 32.04	Bush. 32.04	Bush. 32.04			
Leithgow	2,189	70	Bush. 31.27	Bush. 33.31	Bush. 28.01	1,657	877	Bush. 30.94	Bush. 32.04	Bush. 34.47	Bush. 30.94	Bush. 30.94	Bush. 30.94			
Linlithgow	76,672	1,044	Bush. 37.71	Bush. 35.95	Bush. 37.53	16,065	3,087	Bush. 42.69	Bush. 42.69	Bush. 44.08	Bush. 42.69	Bush. 42.69	Bush. 42.69			
Nairn	990	33	Bush. 32.18	Bush. 28.91	Bush. 29.97	103,621	3,201	Bush. 34.03	Bush. 30.13	Bush. 42.72	Bush. 34.03	Bush. 34.03	Bush. 34.03			
Orkney	..	..	Bush. 32.18	Bush. 28.91	Bush. 29.97	180,051	6,201	Bush. 34.03	Bush. 30.13	Bush. 42.72	Bush. 34.03	Bush. 34.03	Bush. 34.03			
Peebles	..	..	Bush. 32.18	Bush. 28.91	Bush. 29.97	180,051	6,201	Bush. 34.03	Bush. 30.13	Bush. 42.72	Bush. 34.03	Bush. 34.03	Bush. 34.03			
Perth	265,005	6,623	Bush. 38.79	Bush. 33.80	Bush. 40.27	16,766	604	Bush. 32.71	Bush. 31.38	Bush. 44.47	Bush. 32.71	Bush. 32.71	Bush. 32.71			
Renfrew	77,693	1,896	Bush. 40.97	Bush. 33.04	Bush. 40.13	564,600	16,451	Bush. 34.03	Bush. 30.13	Bush. 44.47	Bush. 34.03	Bush. 34.03	Bush. 34.03			
Ross and Cromarty	71,156	1,679	Bush. 42.38	Bush. 34.34	Bush. 37.56	6,742	12,123	Bush. 39.13	Bush. 31.96	Bush. 44.08	Bush. 39.13	Bush. 39.13	Bush. 39.13			
Roxburgh	22,427	622	Bush. 30.06	Bush. 30.77	Bush. 30.06	484,028	13,478	Bush. 32.86	Bush. 32.86	Bush. 44.08	Bush. 32.86	Bush. 32.86	Bush. 32.86			
Selkirk	..	..	Bush. 30.06	Bush. 30.06	Bush. 30.06	440,509	13,478	Bush. 32.86	Bush. 32.86	Bush. 44.08	Bush. 32.86	Bush. 32.86	Bush. 32.86			
Shetland	..	..	Bush. 30.06	Bush. 30.06	Bush. 30.06	8,940	8,940	Bush. 30.06	Bush. 30.06	Bush. 44.08	Bush. 30.06	Bush. 30.06	Bush. 30.06			
Stirling	74,259	2,114	Bush. 35.13	Bush. 30.17	Bush. 34.43	43,590	2,029	Bush. 31.62	Bush. 30.47	Bush. 37.34	Bush. 31.62	Bush. 31.62	Bush. 31.62			
Sutherland	..	..	Bush. 30.17	Bush. 30.17	Bush. 34.43	184,065	5,786	Bush. 31.62	Bush. 30.47	Bush. 37.34	Bush. 31.62	Bush. 31.62	Bush. 31.62			
Wigtown	22,040	821	Bush. 26.80	Bush. 18.00	Bush. 26.70	68,781	1,966	Bush. 35.16	Bush. 30.38	Bush. 33.70	Bush. 35.16	Bush. 35.16	Bush. 35.16			
Total	1,971,007	53,294	Bush. 30.98	Bush. 30.11	Bush. 29.15	84,357	223,205	Bush. 34.89	Bush. 30.57	Bush. 32.96	Bush. 34.89	Bush. 30.57	Bush. 30.57			

\* As computed from Returns furnished by Estimators in 1885.

TABLE No. 3.—ESTIMATED TOTAL PRODUCE OF BEANS, PEAS, AND POTATOES IN THE YEAR 1891, AVERAGE AND ESTIMATED AVERAGE YIELD PER ACRE, AND POTATOES IN THE YEAR 1890 AND 1889, IN EACH OF THE COUNTIES OF SCOTLAND.

COUNTIES.	BEANS.					PEAS.					POTATOES.				
	Average Yield per Acre.					Average Yield per Acre.					Average Yield per Acre.				
	1891.					1891.					1891.				
	Total Produce in 1891.	Acres.	* Ordinary.	1890.	1889.	Total Produce in 1891.	Acres.	* Ordinary.	1890.	1889.	Total Produce in 1891.	Acres.	* Ordinary.	1890.	1889.
Aberdeen	7,991	585	23.59	28.17	29.52	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Argyle	2,145	127	18.89	35.13	24.66	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Ayr	26,327	757	33.46	34.47	30.01	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Banff	2,401	99	24.86	27.20	30.46	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Berwick.	38,943	1,096	30.97	33.91	33.30	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Bute	1,043	59	37.68	30.96	37.41	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Caithness	1,128	50	37.68	30.96	37.41	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Clackmannan.	17,440	528	30.74	30.96	37.41	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Dumfriesshire	4,799	166	30.74	30.96	37.41	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Dumfries	8,693	202	38.19	35.68	30.81	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Edinburgh	42,370	1,927	34.54	34.45	30.77	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Elgin or Moray	1,894	65	29.14	31.93	25.67	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Fife	21,440	678	31.63	33.95	32.80	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Galloway	41,293	1,202	32.72	33.54	32.08	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Haddington	10,356	528	32.60	33.88	32.08	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Inverness	96	3	32.60	33.88	32.08	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Kinross	2,725	81	33.64	31.26	34.95	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Kirkcubright	93,510	952	33.51	33.60	33.68	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Lanark	15,814	467	33.86	34.07	32.84	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Linlithgow	†	†	†	†	†	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Nairn	†	†	†	†	†	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Orkney	†	†	†	†	†	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Perth	2,708	2	25.00	30.00	35.00	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Perthshire	20,183	463	33.60	34.07	32.84	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Renfrew	164	403	27.33	23.42	27.80	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Ross and Cromarty	8,200	237	31.91	33.03	30.88	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Roxburgh	†	†	†	†	†	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Selkirk	†	†	†	†	†	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Shetland	87,606	2,645	30.70	28.96	33.34	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Stirling	24	1	24.00	27.96	33.00	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Sutherland	7,586	202	28.95	27.96	26.71	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Wigtown	†	†	†	†	†	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82
Total	493,495	15,321	32.31	32.31	32.31	Bush.	23.14	Bush.	23.02	Bush.	31,775	7,405	4.20	5.40	5.82

\* As computed from Returns furnished by Estimators in 1885.

† Produce picked green.

† The produce of 4 acres was picked green.

§ The produce of 33 acres was picked green.



TABLE NO. 5.—ESTIMATED TOTAL PRODUCE OF HAY FROM CLOVER, SAINFOIN, AND GRASSES UNDER ROTATION, ALSO TOT PASTURE, IN THE YEAR 1891, ACREAGE, ESTIMATED AVERAGE YIELD PER ACRE, ESTIMATED ORDINARY AVERAGE YIELD, AN PER ACRE IN 1890 AND 1889 IN EACH OF THE COUNTIES OF SCOTLAND.

COUNTIES.	FROM CLOVER, SAINFOIN, AND GRASSES.					FROM PERMANENT PASTURE.				
	Average Yield per Acre.					Average Yield per Acre.				
	Total Produce in 1891.	Acreage in 1891.	1891.	Ordinary Average.*	1890.	1889.	Acreage in 1891.†	1891.	Ordinary Average.	1890.
Aberdeen . . . . .	Cwt. 562,040	Acre. 41,176	Cwt. 20.28	Cwt. 99.12	Cwt. 26.93	Cwt. 68,852	Acre. 9,503	Cwt. 10.16	Cwt. 22.61	Cwt. 21.00
Argyle . . . . .	526,224	40,862	24.16	98.74	28.46	322,745	19,300	24.16	20.35	20.70
Ayr . . . . .	167,777	30,874	30.62	90.62	36.51	470,578	18,980	20.00	38.00	38.00
Banff . . . . .	278,693	19,854	25.77	98.93	26.26	25,056	10,300	10.30	10.97	20.00
Berwick . . . . .	246,513	9,068	31.08	99.01	37.51	80,839	2,985	80.66	85.04	34.84
Bute . . . . .	24,062	9,087	31.05	99.41	40.00	14,300	668	22.16	34.33	32.09
Caithness . . . . .	29,084	8,071	27.00	92.60	47.25	41,539	2,671	16.55	—	21.76
Dumfriesshire . . . . .	37,930	1,434	26.24	90.94	32.16	16,180	525	28.91	29.96	20.25
Dumfries . . . . .	159,918	6,041	23.47	94.05	36.15	54,048	2,027	26.96	26.88	29.14
Dundee . . . . .	242,147	15,250	15.88	94.99	30.09	801,087	17,760	17.01	41.00	34.36
Edinburgh . . . . .	475,750	11,989	39.68	97.55	47.68	82,898	2,554	32.46	34.26	36.00
Highland . . . . .	140,332	6,058	23.16	98.71	23.82	1,221	1,221	18.51	20.00	17.92
High or Moray . . . . .	638,088	24,162	26.41	83.78	34.85	22,600	1,221	24.88	28.21	31.80
Inverclyde . . . . .	405,819	17,584	23.14	93.78	32.83	168,225	6,701	20.00	20.75	20.00
Kelso . . . . .	375,042	9,389	40.40	87.84	38.94	25,043	856	31.32	30.38	24.99
Kilbride . . . . .	175,348	11,820	15.40	21.74	18.63	63,453	5,170	12.27	13.25	11.58
Kilbride . . . . .	277,815	10,969	25.97	27.45	30.99	27,057	1,885	10.97	16.08	19.97
Kilbride . . . . .	89,984	1,473	23.01	91.86	35.02	84.80	20,380	20.70	20.83	40.69
Kilbride . . . . .	838,324	29,417	33.60	91.27	37.99	235,047	11,270	21.12	28.68	32.63
Kilbride . . . . .	228,420	6,722	33.24	35.07	36.76	434,447	12,793	23.96	37.94	43.87
Kilbride . . . . .	88,670	2,068	18.88	27.92	18.70	22,022	797	28.80	33.27	36.48
Kilbride . . . . .	195,743	9,111	21.26	33.88	36.60	7,798	1,970	14.08	20.00	16.01
Kilbride . . . . .	52,727	1,901	27.74	28.77	30.78	11,126	1,108	6.68	28.98	4.00
Kilbride . . . . .	815,244	26,722	27.86	33.88	32.16	268,488	12,428	28.02	34.18	27.99
Kilbride . . . . .	958,976	11,957	29.65	33.56	39.64	242,802	6,899	23.09	21.13	25.53
Kilbride . . . . .	192,282	12,349	16.57	27.96	20.38	34,982	9,272	37.94	46.89	42.19
Kilbride . . . . .	220,870	7,539	30.09	37.74	35.24	140,010	5,059	29.45	36.49	38.00
Kilbride . . . . .	31,121	1,084	39.21	37.78	39.21	45,016	1,821	24.72	30.30	28.66
Kilbride . . . . .	20,490	624	32.84	40.00	41.40	28,170	1,424	19.78	20.00	18.97
Kilbride . . . . .	919,468	12,884	25.90	29.53	31.14	96,814	3,643	25.19	18.31	30.36
Kilbride . . . . .	56,424	8,526	16.00	19.96	21.61	16,829	1,437	11.86	3.21	18.14
Kilbride . . . . .	102,442	9,608	28.89	38.21	43.02	5,898	5,898	23.14	32.78	35.48
Total . . . . .	9,984,280	367,278	25.55	..	..	8,680,170	158,423	28.72	..	..

\* As computed from Returns furnished by Estimators in 1885.

† Exclusive of unenclosed mountain la

TABLE NO. 6.—NUMBER OF HORSES, CATTLE, SHEEP, AND PIGS IN EACH COUNTY OF SCOTLAND AS RETURNED ON JUNE 4, 1891.

COUNTIES.	HORSES (including Ponies).				CATTLE.				SHEEP.			
	Used solely for Agriculture, &c.	Unbroken Horses.	Mares kept solely for breeding.	Total.	Cows and Heifers in Milk or in Calf.	Other Cattle.		Total.	1 Year Old and above.	Under 1 Year.	Total.	Pigs.
						2 years and above.	Under 2 years.					
1. Aberdeen . . . . .	21,439	6,048	199	27,686	47,667	42,806	89,676	174,048	162,918	84,076	297,894	12,588
2. Argyle . . . . .	4,497	2,265	202	7,022	23,218	14,770	24,806	62,798	731,881	924,771	1,950,652	4,667
3. Argyll . . . . .	6,650	2,167	390	9,197	50,793	14,766	87,881	103,400	238,741	145,449	386,890	16,520
4. Banff . . . . .	6,006	1,845	92	8,013	14,963	7,149	24,808	46,920	49,110	85,002	84,112	4,199
5. Berwick . . . . .	4,243	1,088	222	5,548	3,729	5,246	8,769	17,744	166,071	142,908	308,879	4,996
6. Bute . . . . .	952	840	60	1,842	8,751	1,684	4,232	9,667	94,143	17,013	105,156	866
7. Caithness . . . . .	4,619	1,055	28	5,692	7,983	8,835	10,691	22,069	79,279	47,932	127,211	1,821
8. Clackmannan . . . . .	622	185	3	710	1,666	898	1,661	4,063	6,821	4,304	11,125	2,119
9. Dumbarton . . . . .	1,921	501	74	1,996	8,093	2,013	4,757	16,463	51,217	26,812	78,029	1,065
10. Dumfries . . . . .	5,610	1,844	260	7,714	19,054	13,355	28,769	61,768	385,418	194,386	580,254	12,485
11. Edinburgh . . . . .	3,632	764	81	4,467	13,144	4,068	5,248	22,460	110,632	77,905	188,547	7,377
12. Elgin . . . . .	3,697	1,088	42	4,827	6,544	3,244	11,899	21,987	42,186	27,144	69,330	8,414
13. Fife . . . . .	7,650	1,818	148	9,516	11,746	16,891	20,044	47,681	71,894	46,487	118,801	7,489
14. Forfar . . . . .	8,265	1,706	105	10,078	13,134	17,874	20,858	8,196	101,498	63,843	164,841	2,198
15. Haddington . . . . .	8,095	380	46	8,521	1,870	3,010	8,316	50,272	56,708	65,708	183,705	3,832
16. Inverness . . . . .	6,784	2,041	94	8,919	21,569	8,313	20,400	26,990	494,824	210,890	675,714	8,050
17. Kinross . . . . .	3,926	869	35	4,860	7,854	5,460	19,676	6,072	20,990	18,037	47,385	459
18. Kirkcaldy . . . . .	650	204	6	949	1,217	1,406	3,449	6,072	20,990	16,920	36,916	459
19. Kirkcubright . . . . .	3,911	1,777	241	5,929	16,048	14,581	20,700	61,359	264,275	140,980	405,255	7,058
20. Linlithgow . . . . .	5,985	1,992	311	8,288	40,041	10,594	23,818	76,393	163,856	92,687	246,542	7,392
21. Perth . . . . .	1,492	618	68	2,201	4,893	9,215	4,690	12,697	24,460	11,452	35,932	1,763
22. Nairn . . . . .	867	248	11	1,224	1,937	793	788	6,618	14,608	5,787	20,895	861
23. Orkney . . . . .	1,065	1,065	55	2,205	6,047	4,177	12,698	26,747	20,098	19,518	89,541	5,916
24. Shetland . . . . .	785	2,072	2,196	5,053	8,023	5,694	5,227	18,884	61,269	40,370	101,890	9,143
25. Peebles . . . . .	888	1,172	27	2,172	2,013	1,846	3,644	7,008	116,467	80,694	197,061	786
26. Perth . . . . .	10,267	2,643	224	13,134	20,671	21,640	38,516	80,727	618,316	281,247	760,566	9,015
27. Renfrew . . . . .	2,445	908	188	3,561	17,662	3,087	8,009	28,728	24,423	112,496	39,529	1,468
28. Ross and Cromarty . . . . .	6,020	1,878	92	7,990	18,424	8,389	17,094	43,857	216,842	115,008	329,530	6,579
29. Roxburgh . . . . .	8,068	533	157	8,688	5,196	5,127	8,358	18,676	288,448	224,846	512,794	9,919
30. Selkirk . . . . .	655	73	13	741	1,309	651	1,695	9,565	94,299	60,647	168,946	480
31. Stirling . . . . .	8,222	1,860	103	10,185	12,220	8,927	12,015	33,162	80,229	44,658	124,787	2,241
32. Sutherland . . . . .	2,177	827	43	3,047	5,801	1,974	4,520	12,296	162,241	63,928	216,169	1,297
33. Wigton . . . . .	4,145	2,090	804	7,039	22,682	7,805	18,945	49,482	84,212	48,705	132,917	10,460
Total . . . . .	145,422	48,568	6,177	199,167	445,377	263,516	514,404	4,864,860	2,759,534	7,623,900	157,508	



TABLE NO. 7.—QUANTITIES AND VALUES OF THE IMPORTS OF LIVE CATTLE, SHEEP, AND SWINE, 1889 AND 1890.

	QUANTITIES.		VALUES.	
	1889.	1890.	1889.	1890.
	No.	No.	£	£
Live cattle . . . . .	555,222	642,596	9,069,327	10,505,525
Live sheep . . . . .	677,958	358,458	1,195,132	696,312
Live pigs . . . . .	25,324	4,036	93,373	14,474
Total . . . . .	..	..	10,359,832	11,216,311

TABLE NO. 8.—QUANTITIES AND VALUES OF THE IMPORTS OF BEEF, MUTTON, PORK, BACON, HAMS, FISH, EGGS, BUTTER, &amp;c., 1889 AND 1890.

	QUANTITIES.		VALUES.	
	1889.	1890.	1889.	1890.
	Cwt.	Cwt.	£	£
Meat—				
Beef, fresh . . . . .	1,385,752	1,854,593	3,029,154	3,923,015
Beef, salted . . . . .	262,498	274,726	368,778	381,734
Beef, preserved otherwise . . . . .	..	551,088	..	1,424,419
Mutton, fresh . . . . .	1,225,058	1,656,419	2,575,396	3,447,776
Mutton, preserved . . . . .	..	78,409	..	181,482
Pork, fresh . . . . .	384,700	45,249	678,922	109,764
Pork, salted . . . . .	..	254,857	..	341,424
Bacon . . . . .	3,503,264	3,790,570	7,298,459	6,978,061
Hams . . . . .	980,944	1,209,446	2,508,833	2,869,115
Unenumerated, salted or fresh . . . . .	..	105,878	..	227,572
.. other than by salting . . . . .	..	106,304	..	340,294
Total . . . . .	..	9,924,549	..	20,224,656
Fish . . . . .	1,988,029	2,295,974	2,598,623	2,811,455
Rabbits . . . . .	123,874	143,645	341,733	308,110
Poultry and game (see value) . . . . .	..	..	473,193	497,857
Butter . . . . .	1,927,842	2,027,717	10,244,636	10,598,848
Margarine . . . . .	1,241,690	1,079,856	3,655,001	3,083,241
Cheese . . . . .	1,907,999	2,144,074	4,490,970	4,975,134
Lard . . . . .	1,192,654	1,273,236	2,176,552	2,091,704
Eggs . . . . . Thousands	1,131,900	1,294,950	5,127,590	5,428,806
Total . . . . .	..	..	27,066,138	27,885,155

TABLE NO. 9.—QUANTITIES AND VALUES OF THE IMPORTS OF WHEAT AND WHEAT-FLOUR, 1889 AND 1890.

	QUANTITIES.		VALUES.	
	1889.	1890.	1889.	1890.
	Cwt.	Cwt.	£	£
Wheat . . . . .	58,531,887	60,474,180	22,510,502	23,583,844
Wheat-flour . . . . .	14,672,082	15,773,336	8,543,908	9,074,288
Total . . . . .	73,223,969	..	31,054,410	32,658,132

TABLE NO. 10.—QUANTITIES AND VALUES OF THE IMPORTS OF BARLEY, OATS, INDIAN CORN, RYE, MEAL, &amp;c., 1889 AND 1890.

	QUANTITIES.		VALUES.	
	1889.	1890.	1889.	1890.
	Cwt.	Cwt.	£	£
Barley . . . . .	17,400,910	16,677,988	4,964,739	4,985,406
Oats . . . . .	15,990,567	12,737,186	4,470,420	3,908,497
Maize . . . . .	36,192,325	43,437,834	8,590,322	9,865,035
Peas . . . . .	1,695,179	1,842,488	556,120	605,099
Beans . . . . .	3,579,579	3,314,918	1,121,567	995,505
Rye . . . . .	595,001	579,124	174,552	178,327
Buckwheat . . . . .	129,646	100,940	36,906	30,335
Total . . . . .	75,583,207	..	19,904,626	20,561,202
Oatmeal . . . . .	292,088	285,040	137,635	147,147
Other meals . . . . .	270,505	377,939	88,780	118,103
Total . . . . .	532,593	..	226,615	265,250

TABLE NO. 11.—AVERAGE PRICES PER HEAD OF VARIOUS KINDS OF ANIMALS, DEAD MEAT, AND PROVISIONS IMPORTED INTO THE UNITED KINGDOM IN 1889 AND 1890.

Kind of Animals, Dead Meat, &c.	1889.	1890.
Animals—Horses . . . . . each	£20 1 0	£17 8 4
" Oxen and bulls from all countries . . . . . "	18 8 2	18 0 11
" Sheep, including lambs, from all countries . . . . . "	1 15 3	1 18 10
" Pigs . . . . . "	3 15 3	3 11 9
Bacon—From all countries . . . . . per cwt.	2 1 7	1 16 10
Hams—From all countries . . . . . "	2 11 1	2 7 5
Beef, salted—From all countries . . . . . "	1 7 11	1 7 9
" fresh—From all countries . . . . . "	2 3 8	2 2 4
Pork, salted—From all countries . . . . . "	1 9 0	1 6 10
" fresh—From all countries . . . . . "	2 3 11	2 8 6
Butter—From all countries . . . . . "	5 6 3	5 4 6
Margarine . . . . . "	2 18 10	2 17 1
Cheese—From all countries . . . . . "	2 7 0	2 6 5
Potatoes—From all countries . . . . . "	0 7 10	0 7 4
Eggs—From all countries . . . . . per 120	0 6 7	0 6 8
Lard—From all countries . . . . . per cwt.	1 16 5	1 12 10

TABLE NO. 12.—RETURN OF THE AVERAGE PRICES OF WOOL IN THE YEARS 1889 AND 1890.

Years.	Australian.	South African.	English Fleeces.
	Per lb. s. d.	Per lb. s. d.	Per lb. s. d. s. d.
1889 . . . . .	0 10½	0 10½	0 9¾ to 1 0½
1890 . . . . .	0 11	0 10½	0 10 " 1 1

[EDINBURGH

EDINBURGH CORN-MARKET GRAIN TABLES for WHEAT, BARLEY, OATS, and BEANS, showing the Quantity offered for Sale, the Quantity Sold, the Highest, Lowest, and Average Prices, also the Bushel-weights of the Highest and Lowest Prices of each kind of Grain for every Market-day, likewise the Results for every Month, and the final Result for the year 1891.

## WHEAT.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for	
						Highest Price.	Lowest Price.
1891							
Jan.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	s. s.	s. s.
7	398	373	35 6	29 6	33 11	63½	58½
14	575	575	36 6	25 6	33 0	63½	56
21	667	502	36 3	23 6	33 1	63	59½
23	531	450	35 0	20 0	33 4	63½	58½
	2,171	1,900	35 10	27 11	33 3		
Feb.							
4	428	360	35 0	31 6	32 11	64½	53½
11	1,132	828	35 0	26 3	32 2	64	58½
18	430	367	34 0	25 0	30 11	63½	57½
25	513	464	34 0	24 6	31 10	63½	55
	2,493	2,019	34 5	25 8	32 0		
March							
4	338	330	34 6	25 0	32 10	62½	56½ 59
11	540	394	37 0	26 0	34 11	62	58½
18	452	424	37 0	24 0	34 11	62	59½
25	459	403	37 0	29 0	34 11	63 63½	62
	1,789	1,551	36 4	26 5	34 6		
April							
1	450	410	38 0	35 0	36 10	62	61
8	317	260	40 6	37 0	39 7	64½ 64½	62
15	620	373	42 0	29 0	39 11	63	56½
22	666	508	44 0	31 6	41 7	63	60
29	1,708	782	43 0	38 0	40 10	64	62
	3,761	2,333	41 10	35 4	40 0		
May							
6	2,241	1,537	40 6	32 0	38 3	63½ 64½	62
13	1,227	1,157	40 6	23 0	37 10	64½	58½
20	1,158	969	40 6	33 0	39 3	63½	60½
27	1,806	1,438	40 6	34 0	38 9	63½	62
	6,432	5,151	40 6	31 7	38 6		
June							
3	1,341	992	40 0	30 0	38 5	64 64½	56½
10	1,597	1,197	39 0	27 0	37 7	63 63½	56½
17	1,311	1,001	38 9	23 0	36 11	64½	57½
24	1,089	749	38 6	31 0	36 1	64	60½
	5,338	3,939	39 2	29 1	37 4		
July							
1	1,197	857	37 6	30 0	35 8	63½ 65½	58½
8	865	626	38 0	33 0	36 9	64½	59½
15	740	684	38 0	29 0	36 8	63	60½
22	504	457	37 9	23 0	36 10	63½	57½
29	764	704	38 6	36 9	37 9	63½	62½
	4,160	3,328	38 2	34 6	36 8		

## WHEAT—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for	
						Highest Price.	Lowest Price.
1891 Aug.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	s. s.	s. s.
5	864	755	39 6	35 0	37 11	63	60½
12	1,530	1,061	41 0	36 6	38 5	63	62½
19	1,738	868	41 0	38 0	39 7	64	61½ 62½
26	1,233	996	41 6	35 0	39 9	64	63
	5,363	3,680	40 8	36 10	38 11		
Sept.							
2	1,103	1,001	41 6	27 0	40 3	63½ 64	55
9	264	204	41 0	33 0	40 4	63	60½ 62
16	379	358	42 0	35 0	39 11	64½	60½
23	272	77	41 6	36 0	39 10	63½	61
30	312	265	41 0	30 0	38 11	63½ 63½	57
	2,330	1,898	41 4	34 2	40 0		
Oct.							
7	247	176	42 0	34 0	36 7	63 63½	60½
14	265	212	43 0	33 0	40 5	61 63½	60
21	1,021	474	48 0	30 0	41 7	63½	58½
28	796	659	48 0	30 0	42 5	62	58½
	2,329	1,521	44 10	33 1	41 2		
Nov.							
4	796	344	49 0	31 0	42 4	63½ 63½	60
11	839	445	48 0	33 0	42 7	63½ 64	56½
18	570	268	47 0	35 0	41 10	63½	60½
25	566	115	46 0	30 0	41 3	63	55
	2,771	1,172	47 4	31 9	42 3		
Dec.							
2	478	272	47 0	35 0	40 5	64	60
9	325	210	42 0	31 0	39 7	63 64	58
16	214	130	41 0	29 6	37 4	62	57½
23	208	188	43 0	30 0	37 5	64	63
30	259	161	40 0	34 0	38 1	62 63	59
	1,484	961	41 6	34 3	38 10		
Result for year	40,421	29,453	39 4	31 7	37 8		

## BARLEY.

1891 Jan.							
7	2,192	1,567	30 6	23 6	27 9	56 57	53
14	2,800	1,773	31 6	22 0	28 1	57 57½	52
21	2,381	840	35 0	24 0	28 0	58½	58
28	3,682	1,724	34 0	20 6	28 3	57	53
	11,005	5,904	31 11	22 8	28 0		
Feb.							
4	3,693	1,240	34 0	20 0	28 11	57	48 52
11	3,498	1,285	32 0	21 0	26 11	56½	49½
18	3,327	1,471	34 0	22 0	27 3	57	53½
25	3,244	1,970	33 6	22 6	27 9	57	54½
	18,762	5,966	33 10	21 0	27 8		

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1891							
March	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	s. s.	s. s.
4	1,807	1,850	34 0	24 0	28 3	58½	52½ 54
11	1,588	845	33 6	23 6	28 9	58½	52½
18	2,478	1,423	35 0	20 6	28 1	58½	48
25	2,028	1,297	32 6	23 6	29 6	57	51½
	7,801	4,915	33 10	22 7	28 7		
April							
1	1,690	1,128	32 6	23 3	28 1	58½	55
8	1,205	668	30 0	25 0	27 10	56	53
15	1,055	548	30 0	26 0	28 0	58	55
22	871	724	30 6	26 6	29 8	56 56½	55½
29	796	490	31 6	28 0	29 8	56½	54½ 56
	5,617	3,558	30 6	25 6	28 7		
May							
6	872	418	31 0	26 6	28 10	58	55
13	356	167	29 0	26 0	27 8	56	54½ 55
20	345	280	29 0	27 0	27 9	57	56
27	289	189	29 0	27 0	28 2	57	56½
	1,862	1,004	29 6	26 9	28 3		
June							
3	127	96	29 0	28 3	28 6	56	55½
10	57	87	28 6	28 3	28 5	56	56
17	76	31	29 6	26 0	27 7	56½	54
24	175	122	29 8	28 0	28 4	56½	56½
	435	306	28 10	28 0	28 4		
July							
1	194	127	27 6	23 6	26 7	54 56	52
8	170	160	28 3	26 0	27 9	56	51½
15	94	..	..	..	..	54½	..
22	150	110	29 3	25 6	28 2	56	52
29	30	30	27 9	27 9	27 9	56	56
	638	427	28 0	26 8	27 6		
Aug.							
5	154	154	29 0	27 6	28 1	57	56
12	36	..	..	..	..	..	..
19	36	36	29 0	28 0	28 4	56	56
26	35	35	29 0	28 6	28 7	55½	55½
	261	225	29 0	28 1	28 2		
Sept.							
2	86	50	30 6	30 6	30 6	56½	56½
9	489	494	35 0	30 0	32 8	56½	55
16	982	634	35 0	28 0	32 2	56½	55½
23	2,185	1,395	34 0	26 3	30 9	56½	55
30	1,766	1,074	33 0	26 0	29 11	56	51½ 53½
	5,508	3,587	33 5	27 9	31 0		
Oct.							
7	1,444	1,283	33 6	25 6	28 9	56	53 54½
14	886	711	33 0	27 0	30 4	56	55
21	1,311	952	34 0	28 0	30 10	56	54½ 56
28	1,508	794	34 6	26 0	30 10	56½	55
	5,149	3,740	33 8	27 0	30 1		

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel-weights for	
						Highest Price.	Lowest Price.
1891 Nov.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	s. s.	s. s.
4	1,913	1,304	35 6	27 0	32 1	56½ 56½	52½ 53
11	1,844	1,509	36 0	29 3	33 1	56 57	56
18	2,181	1,333	35 0	27 0	32 11	57	55
25	2,626	1,207	34 6	28 0	31 7	56½	52½ 54½
	8,564	5,353	35 3	27 10	32 6		
Dec.							
2	2,093	1,061	33 6	23 0	30 7	57½	50½
9	1,406	1,089	32 9	27 0	30 11	56 56½	53½
16	1,766	1,366	32 6	26 0	30 5	56½	53½
23	1,433	1,203	32 6	27 0	30 4	56 57½	56
30	1,019	825	32 6	26 6	30 6	56 56½	54½
	7,747	5,544	32 7	26 1	30 7		
Result for year	68,449	40,529	32 4	26 0	29 5		

### OATS.

1891 Jan.							
7	2,458	1,713	23 6	16 0	20 1	46½	41
14	2,196	1,775	24 0	17 0	20 5	45	36½ 41½
21	2,554	1,830	23 6	16 3	20 5	44½	40
28	3,845	2,187	24 0	17 0	20 2	45½	37½ 39½
	10,553	7,505	23 9	16 9	20 3		
Feb.							
4	4,282	2,642	23 3	16 6	19 10	45	40 41
11	5,247	2,402	24 0	17 0	20 1	43½ 46	40 42½
18	4,923	2,618	24 0	16 0	20 2	43½ 44½	40
25	5,198	2,714	24 6	12 0	20 8	44½ 46½	37
	19,650	10,876	24 0	16 4	20 2		
March							
4	5,424	2,687	24 6	16 0	20 3	44½ 46½	41
11	5,973	3,861	26 0	16 9	20 7	45½	39½
18	5,312	2,611	25 0	17 0	20 7	44½ 45½	37½ 40
25	4,361	3,325	25 6	17 3	21 2	45 46½	41½
	21,070	12,434	25 0	16 9	20 8		
April							
1	4,699	3,546	26 0	18 9	22 8	45½	41
8	3,293	2,883	26 6	20 0	23 7	44½ 46½	40½ 41
15	4,091	1,436	27 0	21 0	23 8	44½	40 41½
22	3,313	2,448	27 0	19 3	24 10	46½	41
29	3,857	1,763	26 6	21 6	24 8	44½ 45½	42
	18,758	12,076	26 6	20 3	23 9		
May							
6	3,858	1,480	26 0	21 0	24 1	45 46½	40 42½
13	3,787	1,199	25 0	21 6	23 5	44½ 46	40
20	2,397	1,012	25 6	20 6	23 10	45 45½	40
27	2,748	1,883	25 6	20 6	23 10	45½ 46½	40
	12,790	5,574	25 4	20 10	23 10		

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1891							
June	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	s. s.	s. s.
3	2,287	1,661	26 6	20 0	23 11	44½	37½ 40
10	2,236	1,005	26 6	22 6	24 5	45	41
17	2,042	1,221	26 9	22 9	24 9	45½	42
24	2,153	1,385	26 9	22 8	24 8	44½ 45	41
	8,718	5,272	26 8	21 8	24 5		
July							
1	1,899	876	26 6	22 6	24 9	45½	42
8	2,458	1,158	26 9	22 0	24 11	45½	43
15	1,517	944	27 0	21 6	24 7	45	41
22	1,745	1,311	26 9	23 0	24 10	44½	42
29	1,661	542	28 0	23 0	25 7	46	42
	9,280	4,831	27 1	22 2	24 10		
Aug.							
5	2,363	1,139	27 0	22 3	24 5	45½	41½
12	2,153	997	27 6	22 6	25 1	46½	40½
19	2,204	775	27 0	22 0	24 5	45½	41
26	1,930	852	26 6	22 0	24 9	44	41
	8,650	3,763	27 0	22 3	24 8		
Sept.							
2	1,564	921	26 9	23 0	24 10	44 46	42
9	1,404	954	28 0	23 0	25 7	45	44
16	1,733	1,310	26 3	21 0	23 9	44½	42½
23	1,647	1,428	26 0	21 3	24 0	44	41
30	1,672	1,558	27 0	19 0	23 9	44½	39½
	8,010	6,171	26 9	21 4	24 3		
Oct.							
7	2,556	2,007	27 6	19 0	23 0	44½	39½
14	2,469	2,046	27 6	20 0	23 3	44½ 45	40
21	3,231	2,130	26 6	20 0	23 1	45 45½	40
28	2,664	2,363	27 6	20 6	24 5	44 45	39
	10,920	8,546	27 1	19 10	23 6		
Nov.							
4	3,111	2,448	31 0	22 0	26 5	46½	37½
11	3,254	2,739	32 0	23 0	27 11	45	37
18	4,374	1,628	31 0	23 0	27 3	45½	41
25	4,352	2,041	29 0	21 0	25 7	45	37½
	15,091	8,856	30 11	22 0	26 10		
Dec.							
2	2,525	1,197	29 0	21 0	25 7	43½	39
9	3,002	1,965	28 0	22 6	25 5	45½	40 41
16	4,132	1,931	27 6	20 0	24 7	45 46	37½
23	4,059	1,928	27 0	18 6	24 5	45½	37½
30	2,568	1,561	26 6	20 0	24 1	43½ 45½	37½ 40
	16,286	8,582	27 4	20 6	24 10		
Result for year	159,771	93,986	26 4	19 11	23 2		

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1891 Jan.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	s. s.	s. s.
7	55	30	30 0	29 0	29 9	64½	63
14	77	62	32 6	29 0	30 11	66½	63
21	115	65	32 3	29 6	30 0	66½	65
28	245	123	33 0	27 6	30 6	65½	61½
	492	280	31 9	28 10	30 7		
Feb.							
4	282	127	33 0	29 0	30 5	65½	63
11	307	124	35 0	28 0	31 10	65½	62
18	524	160	36 6	28 6	32 2	65½	63
25	539	217	36 6	30 0	31 7	65½	62 64
	1,652	628	35 2	29 5	31 7		
March							
4	370	153	33 0	28 0	30 4	65½	62½
11	268	161	32 6	29 0	30 6	65½	63
18	378	273	32 6	30 0	31 5	65½ 66	63 64
25	182	139	34 0	30 0	31 1	68	64
	1,198	726	32 7	29 6	30 11		
April							
1	164	164	34 6	31 0	33 1	67½	63
8	87	69	36 0	30 3	32 8	65½	64½
15	75	44	35 0	33 9	33 11	65½	64
22	103	103	36 6	32 0	35 2	68½	62
29	93	45	36 0	35 6	35 9	65½	65½
	522	425	35 6	32 6	33 11		
May							
6	159	31	36 0	30 0	35 0	65	63
13	121	..	..	..	..	..	..
20	23	15	35 6	..	35 6	64	..
27	43	28	36 6	34 0	34 11	64½	61
	346	74	35 11	33 0	35 1		
June							
3	10	10	37 0	..	37 0	65½	..
10	64	20	36 6	..	36 6	64½	..
17	13	5	36 6	..	36 6	65½	..
24	119	92	36 6	33 0	35 3	63½ 65½	62½
	206	127	36 7	33 0	35 8		
July							
1	56	40	36 0	35 9	35 11	63½	63½
8	36	14	36 0	34 6	35 3	65½	63½
15	22	22	37 6	..	37 6	63½	..
22	12	..	..	..	..	..	..
29	..	..	..	..	..	..	..
	126	76	36 8	35 5	36 3		
Aug.							
5	30	20	37 0	..	37 0	64½	..
12	53	46	37 9	37 6	37 8	63½	64½ 66
19	..	..	..	..	..	..	..
26	..	..	..	..	..	..	..
	88	66	37 5	37 6	37 5		



## BEANS—continued.

Date.	Quantity offered for Sale.	Quantity Sold.	Highest Price.	Lowest Price.	Average Price.	Table of Bushel- weights for	
						Highest Price.	Lowest Price.
1891							
Sept.	Imp. qr.	Imp. qr.	s. d.	s. d.	s. d.	s. s.	s. s.
2	..	..	..	..	..	..	..
9	..	..	..	..	..	..	..
16	50	10	38 6	..	38 6	63	..
23	..	..	..	..	..	..	..
30	30	30	38 3	..	38 3	63	..
	80	40	38 4	..	38 4		
Oct.							
7	..	..	..	..	..	..	..
14	20	20	40 0	..	40 0	66½	..
21	8	..	..	..	..	..	..
28	..	..	..	..	..	..	..
	28	20	40 0	..	40 0		
Nov.							
4	..	..	..	..	..	..	..
11	19	..	..	..	..	..	..
18	..	..	..	..	..	..	..
25	51	13	36 6	..	36 6	63	..
	70	13	36 6	..	36 6		
Dec.							
2	75	50	40 0	37 0	38 8	63	65½
9	24	..	..	..	..	..	..
16	42	42	38 0	36 0	37 4	65½	63½
23	40	..	..	..	..	..	..
30	118	78	36 6	33 0	34 8	64	65½
	299	170	38 10	34 9	36 6		
Result for year	5,102	2,645	35 7	31 7	32 9		

PRICES OF SHEEP SINCE 1818. TABLE NO. 1.—CHEVIOT SHEEP.

Year.	Wethers.		Ewes.		Lambs.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1818	28 0	to 30 0	not quoted.		8 0	to 10 0
1819	25 0	" 27 0	15 0	to 17 0	10 6	" 12 0
1820	20 0	" 25 0	16 0	" 17 0	10 0	" 11 0
1821	18 0	" 20 0	14 0	" 16 0	7 6	" 8 0
1822	12 6	" 13 0	8 0	" 8 6	4 6	" 0 0
1823	13 6	" 18 0	7 0	" 10 6	5 6	" 6 0
1824	14 0	" 19 0	7 0	" 9 0	4 6	" 6 0
1825	20 0	" 32 0	15 0	" 19 0	9 0	" 10 6
1826	17 6	" 21 6	13 0	" 15 0	7 0	" 7 6
1827	15 0	" 24 0	not quoted.		7 0	" 8 0
1828	18 0	" 27 6	12 0	to 15 0	7 0	" 8 8
1829	18 0	" 24 0	12 6	" 14 0	7 0	" 8 6
1830	15 0	" 21 0	8 0	" 11 0	6 0	" 6 9
1831	18 0	" 25 0	9 0	" 13 0	7 0	" 8 0
1832	19 0	" 24 0	11 0	" 16 0	7 0	" 9 0
1833	22 0	" 31 0	13 6	" 20 0	8 0	" 11 8
1834	22 0	" 31 0	13 6	" 21 0	9 0	" 11 6
1835	22 0	" 27 6	18 0	" 20 6	8 0	" 11 0
1836	24 0	" 31 6	16 0	" 19 0	10 0	" 14 0
1837	19 0	" 28 0	14 0	" 19 0	10 0	" 13 0
1838	23 0	" 30 6	17 0	" 22 0	12 0	" 14 0
1839	23 0	" 31 0	14 0	" 19 0	0 0	" 13 0
1840	24 0	" 33 0	15 0	" 23 0	7 0	" 11 6
1841	23 0	" 30 0	14 0	" 22 0	8 0	" 12 0
1842	22 6	" 28 0	13 0	" 17 0	7 6	" 10 0
1843	19 0	" 25 0	8 0	" 12 0	5 0	" 8 0
1844	21 0	" 59 0	10 0	" 16 0	8 0	" 10 6
1845	23 0	" 33 0	13 0	" 20 0	8 0	" 13 0
1846	24 0	" 33 6	14 6	" 21 6	10 0	" 14 6
1847	24 0	" 35 0	13 0	" 24 0	11 6	" 15 0
1848	23 0	" 34 6	13 0	" 28 0	11 6	" 15 0
1849	21 0	" 30 2	12 0	" 21 0	0 0	" 14 0
1850	20 6	" 29 6	12 0	" 20 0	8 0	" 13 0
1851	21 6	" 31 0	13 0	" 21 0	8 9	" 14 0
1852	21 0	" 32 0	15 0	" 23 0	8 0	" 14 0
1853	26 6	" 38 0	17 0	" 28 6	9 0	" 17 0
1854	25 0	" 36 0	17 0	" 26 0	0 0	" 16 6
1855	23 6	" 36 0	16 0	" 25 0	10 0	" 17 0
1856	22 0	" 35 6	15 6	" 24 0	10 0	" 15 0
1857	24 0	" 36 0	14 6	" 26 0	10 6	" 14 6
1858	24 0	" 34 6	14 0	" 24 6	10 6	" 14 0
1859	26 0	" 34 6	16 0	" 25 0	10 8	" 14 9
1860	26 0	" 38 0	17 6	" 27 6	12 6	" 17 6
1861	25 0	" 38 6	16 0	" 28 0	9 0	" 16 0
1862	27 0	" 37 6	17 6	" 28 0	10 0	" 16 0
1863	25 0	" 38 6	19 0	" 28 6	10 6	" 16 0
1864	31 0	" 41 0	21 0	" 31 6	14 0	" 18 0
1865	32 6	" 44 0	22 6	" 33 6	14 6	" 20 0
1866	37 0	" 50 0	29 0	" 42 6	15 0	" 26 0
1867	26 0	" 58 0	18 0	" 25 6	12 0	" 16 0
1868	30 0	" 32 0	15 6	" 21 0	7 6	" 13 0
1869	28 0	" 38 0	15 0	" 22 6	7 6	" 14 0
1870	35 6	" 43 0	18 0	" 28 0	10 0	" 17 0
1871	36 6	" 49 0	22 0	" 38 6	14 0	" 20 0
1872	45 0	" 50 0	32 0	" 42 0	16 0	" 22 0
1873	42 0	" 51 0	25 0	" 42 0	15 6	" 22 0
1874	33 6	" 44 6	21 0	" 36 0	12 0	" 17 0
1875	53 0	" 48 6	21 0	" 34 0	13 6	" 23 6
1876	40 0	" 52 6	23 0	" 30 0	13 6	" 25 0
1877	41 0	" 51 0	25 0	" 37 0	15 0	" 24 0
1878	35 6	" 48 0	23 6	" 35 0	14 0	" 22 0
1879	34 0	" 44 0	21 0	" 34 0	14 0	" 20 0
1880	30 0	" 43 6	20 0	" 30 0	12 6	" 20 0
1881	32 0	" 45 6	29 0	" 34 0	14 0	" 20 0
1882	40 0	" 51 0	30 0	" 40 0	14 0	" 20 6
1883	44 0	" 55 6	34 6	" 46 6	15 6	" 23 0
1884	36 0	" 47 6	29 6	" 41 6	12 6	" 20 0
1885	30 0	" 38 0	24 0	" 31 0	12 0	" 18 0
1886	32 0	" 40 0	21 0	" 29 0	12 6	" 19 6
1887	29 0	" 36 0	18 0	" 26 0	11 0	" 16 6
1888	30 0	" 38 0	19 0	" 27 0	12 0	" 17 6
1889	36 0	" 44 0	24 0	" 32 0	14 0	" 22 0
1890	31 0	" 40 0	22 0	" 30 0	12 6	" 20 0
1891	27 0	" 38 0	16 0	" 25 0	9 0	" 16 0

TABLE No. 2.—BLACKFACED SHEEP.

Year.	Wethers.		Ewes.		Lambs.	
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1819	22 0	to 24 0	12 0	to 15 0	8 0	to 9 0
1820	20 0	" 23 3	15 6	" 17 0	7 0	" 8 6
1821	18 0	" 20 0	12 0	" 13 0	6 0	" 7 0
1822	11 6	" 13 6	5 6	" 6 0	4 6	" 0 0
1823	12 0	" 16 0	5 0	" 6 6	4 0	" 5 3
1824	9 6	" 13 6	6 0	" 7 0	4 0	" 5 0
1825	22 0	" 26 0	11 0	" 13 6	6 0	" 9 0
1826	15 0	" 17 0	8 0	" 9 0	4 6	" 6 0
1827	14 0	" 18 6	7 0	" 10 0	6 0	" 7 6
1828	15 0	" 20 0	8 0	" 11 0	5 0	" 7 6
1829	14 0	" 18 0	9 0	" 10 0	6 0	" 7 0
1830	9 6	" 13 0	4 0	" 6 0	4 6	" 6 0
1831	13 0	" 17 0	5 0	" 7 6	5 0	" 6 6
1832	14 0	" 18 0	7 0	" 11 6	6 0	" 7 8
1833	16 0	" 24 0	7 6	" 12 0	6 6	" 9 0
1834	16 0	" 22 0	10 0	" 13 0	6 0	" 8 6
1835	15 0	" 18 9	10 0	" 13 0	7 0	" 8 0
1836	15 0	" 21 0	9 0	" 12 0	8 6	" 11 0
1837	13 0	" 16 0	8 0	" 12 0	8 0	" 9 6
1838	15 0	" 20 6	10 0	" 13 0	not quoted.	
1839	15 0	" 22 0	10 0	" 12 0	7 0	to 8 3
1840	15 0	" 22 6	11 0	" 12 0	7 0	" 9 3
1841	16 0	" 20 0	9 0	" 11 0	6 0	" 8 0
1842	14 0	" 19 0	7 6	" 8 0	5 6	" 7 0
1843	not quoted.		4 9	" 6 6	not quoted.	
1844	15 0	to 21 0	6 6	" 10 0	5 0	to 8 0
1845	14 0	" 23 0	8 0	" 12 0	6 0	" 8 0
1846	13 0	" 24 0	10 0	" 13 0	8 0	" 9 0
1847	20 6	" 25 0	10 0	" 14 0	8 6	" 9 6
1848	20 0	" 24 0	11 3	" 12 0	8 6	" 10 0
1849	not quoted.		not quoted.		7 0	" 7 6
1850	..		..		7 0	" 0 0
1851	17 6	to 23 0	9 0	to 12 0	6 6	" 8 0
1852	18 6	" 22 0	9 6	" 12 0	4 6	" 7 9
1853	23 0	" 27 0	14 6	" 16 6	8 0	" 11 6
1854	20 0	" 26 0	11 0	" 16 6	8 0	" 10 6
1855	23 6	" 26 6	14 0	" 16 0	10 0	" 11 0
1856	17 0	" 24 0	10 0	" 20 0	7 6	" 10 0
1857	20 0	" 29 0	10 6	" 15 0	9 3	" 11 0
1858	20 0	" 27 6	9 9	" 18 9	8 3	" 10 8
1859	20 0	" 25 0	10 0	" 14 0	8 9	" 11 0
1860	21 0	" 27 3	11 0	" 16 0	10 0	" 13 6
1861	21 0	" 29 0	12 0	" 22 0	6 3	" 14 0
1862	16 9	" 27 0	12 0	" 18 8	6 0	" 12 0
1863	20 0	" 30 6	13 0	" 16 0	8 0	" 11 6
1864	25 0	" 30 0	15 0	" 19 0	10 0	" 13 6
1865	15 6	" 32 6	15 0	" 25 0	10 0	" 17 0
1866	31 6	" 40 0	20 0	" 36 0	13 6	" 22 6
1867	20 0	" 30 6	14 0	" 22 0	7 6	" 13 6
1868	20 0	" 26 0	10 6	" 13 6	7 0	" 18 0
1869	22 0	" 28 0	11 0	" 14 0	6 9	" 9 0
1870	27 0	" 32 6	13 0	" 22 0	8 0	" 14 6
1871	23 0	" 37 0	13 0	" 23 0	11 0	" 16 3
1872	31 6	" 45 0	18 0	" 32 0	12 6	" 18 0
1873	28 0	" 39 0	16 6	" 27 0	7 0	" 16 0
1874	25 0	" 35 0	13 0	" 20 0	7 0	" 14 0
1875	26 6	" 37 6	15 0	" 21 3	9 6	" 17 6
1876	30 0	" 40 0	19 0	" 24 0	13 0	" 20 6
1877	35 0	" 38 9	18 0	" 25 0	13 6	" 23 0
1878	30 0	" 36 0	17 0	" 23 0	12 0	" 22 0
1879	25 0	" 35 9	16 0	" 24 0	10 6	" 20 0
1880	25 0	" 38 0	16 6	" 22 6	10 0	" 17 0
1881	30 0	" 39 0	15 0	" 23 0	10 0	" 15 0
1882	33 0	" 46 0	20 0	" 28 0	12 6	" 18 6
1883	36 0	" 50 6	24 6	" 33 0	14 0	" 21 6
1884	29 0	" 43 6	19 6	" 28 0	12 0	" 19 6
1885	24 0	" 34 0	13 0	" 22 6	10 0	" 15 0
1886	25 0	" 34 0	12 0	" 22 0	10 6	" 16 0
1887	22 0	" 30 0	11 0	" 19 0	8 0	" 13 0
1888	22 0	" 32 0	13 0	" 24 0	10 0	" 15 0
1889	26 0	" 40 0	18 0	" 29 0	13 0	" 22 0
1890	24 0	" 37 0	14 0	" 27 0	10 6	" 19 0
1891	21 0	" 37 0	10 0	" 24 0	7 6	" 15 0

TABLE No. 3.—PRICE OF WOOL, PER STONE OF 24 LB., SINCE 1818.

Year.	Laid Cheviot.		White Cheviot.		Laid Highland.		White Highland.			
	s.	d.	s.	d.	s.	d.	s.	d.		
1818	40	0	to	42	2	20	0	to	22	6
1819	21	0	"	22	0	10	0	"	10	3
1820	20	0	"	22	0	9	0	"	10	0
1821	18	0	"	20	0	9	0	"	10	0
1822	12	6	"	14	6	5	0	"	6	6
1823	9	0	"	10	6	5	0	"	5	9
1824	13	6	"	15	0	6	0	"	6	3
1825	10	6	"	22	0	10	0	"	10	6
1826	11	0	"	14	0	5	0	"	5	6
1827	11	0	"	14	0	5	6	"	6	9
1828	8	0	"	11	0	5	6	"	6	0
1829	8	6	"	11	0	4	3	"	0	0
1830	9	6	"	11	0	4	6	"	5	0
1831	17	0	"	20	0	7	6	"	8	6
1832	14	0	"	16	0	7	0	"	7	6
1833	18	0	"	20	7	10	0	"	11	0
1834	21	0	"	24	6	5	6	"	7	0
1835	19	0	"	20	6	9	6	"	10	8
1836	21	0	"	25	0	10	0	"	14	0
1837	12	0	"	14	0	7	0	"	7	8
1838	19	0	"	22	6	6	0	"	10	0
1839	18	0	"	20	0	8	0	"	12	0
1840	15	0	"	0	0	7	0	"	0	0
1841	15	0	"	16	9	6	0	"	7	5
1842	12	6	"	14	0	not quoted.				
1843	9	0	"	11	6	5	0	to	6	0
1844	15	0	"	18	0	not quoted.				
1845	14	6	"	17	6	7	6	to	8	6
1846	12	0	"	14	6	8	0	"	8	6
1847	12	6	"	14	0	not quoted.				
1848	9	6	"	11	0	4	9	to	0	0
1849	12	0	"	16	6	6	0	"	6	3
1850	15	0	"	17	6	8	0	"	8	6
1851	12	0	"	16	0	8	0	"	9	3
1852	13	0	"	15	0	8	0	"	9	0
1853	19	0	"	22	0	11	0	"	12	6
1854	12	0	"	15	0	7	6	"	8	6
1855	14	6	"	19	0	8	6	"	9	0
1856	19	0	"	21	6	11	0	"	0	0
1857	19	0	"	24	0	13	0	"	14	3
1858	15	0	"	17	0	8	9	"	10	0
1859	18	6	"	24	0	10	9	"	11	6
1860	22	0	"	32	0	10	0	"	11	3
1861	19	6	"	27	0	not quoted.				
1862	18	6	"	26	0	11	6	to	16	0
1863	25	6	"	31	0	15	3	"	17	6
1864	31	0	"	39	0	17	6	"	20	0
1865	23	0	"	30	0	15	0	"	17	0
1866	24	0	"	30	6	14	0	"	16	0
1867	16	0	"	21	6	not quoted.				
1868	19	0	"	26	0	8	6	to	9	0
1869	18	0	"	26	6	8	6	"	10	0
1870	15	0	"	23	6	9	6	"	0	0
1871	20	0	"	26	6	12	0	"	15	0
1872	26	0	"	37	6	18	0	"	21	0
1873	17	0	"	18	0	9	0	"	12	0
1874	18	6	"	26	6	9	6	"	13	0
1875	25	0	"	32	0	12	6	"	16	0
1876	20	0	"	24	0	9	6	"	12	0
1877	20	9	"	26	0	10	0	"	12	0
1878	18	9	"	25	0	8	6	"	11	6
1879	15	0	"	17	0	7	0	"	0	0
1880	20	0	"	24	0	10	6	"	11	6
1881	17	0	"	21	0	5	0	"	9	6
1882	14	0	"	18	0	7	6	"	9	0
1883	13	0	"	18	0	6	6	"	8	6
1884	13	0	"	18	0	6	6	"	8	6
1885	12	0	"	17	0	6	0	"	8	0
1886	13	0	"	18	0	6	6	"	8	6
1887	14	0	"	22	0	7	0	"	9	0
1888	13	0	"	20	0	7	0	"	9	0
1889	13	0	"	18	0	7	0	"	9	0
1890	13	0	"	18	0	7	0	"	9	0
1891	12	6	"	18	0	7	0	"	9	0

## CHEMICAL DEPARTMENT.

---

REPORTS by Dr A. P. AITKEN, Chemist to the Society.

### PUMPHERSTON EXPERIMENTAL STATION.

#### REPORT ON GRASS EXPERIMENTS, 1891.

THE hay crop of 1891 in all parts of the country, and in none more than in West Lothian, was the poorest that has been produced for many years. Mr Tod, who manages the farm of Pumpherston, reports as follows: "This is the worst season for grass within my recollection. The rainfall in April, May, and June—the grass-making months—was less than three inches, viz. :—

	Rainfall. Inches.	No. of days on which rain fell.
April . . . . .	.32	6
May . . . . .	1.63	12
June . . . . .	.90	8
	<hr/> 2.85	<hr/> 26

The thermometer was below the freezing-point on sixteen nights in April, five nights in May, and one night in June; and on the other nights it was very little above the freezing-point, so that between drought and cold there was very little growth. Not only is the hay crop a failure, but the stackyards in our locality show little more than half their usual bulk of grain crops."

The manures applied to the grass were the same as in the previous year, and are described on p. 193 of last year's 'Transactions'; but owing to the inclemency of the season their effect upon the growth of the grass was less than on any former occasion. On this account the results obtained at Pumpherston in 1891 are shorn of much of their interest.

The only novelty introduced into the experiment last year was that section B, which for five years had been left unmanured, and which had therefore arrived at a stage in which the effects of former manurings were nearly obliterated, so far at least as nitrogenous manures were concerned, was treated with nitrate of soda at the rate of 1 cwt. per acre. The result of that application has been to increase very considerably the amount of the crop on that section, and to enable the dormant stores of phosphatic and potassic manures to exert their influence upon the crop. The same treatment will be repeated on the following crop, when, if the season is favourable to the action of light manures, some useful conclusions may be drawn from the experiment. The manures applied to section C are the same as those applied to section A. They have now been applied for three years in succession, and were last year applied at the same time as those on section A, so that they may be regarded as duplicates of that section. It will be seen, however, that they diverge a good deal from their duplicates in some instances, and these divergences are due to differences of moisture, which in seasons of drought become greatly accentuated. Now that these two sections have had the same kind and quantity of manures applied to them for three years, their combined crop will afford more reliable results than can be furnished by either separately. These are given in Table III., p. 230, and represent an area of one-sixth of an acre. The lessons conveyed by these figures are, that during the season of drought, manures containing soluble phosphate have considerably increased the crop, but, nevertheless, the one containing Thomas-slag, which is an insoluble phosphate, has produced a greater increase than any other. Bone-meal and ground mineral phosphates have remained very inactive. Superphosphate, when applied alone, has been quite dormant, and its failure to increase the grass in the smallest degree shows the error of manuring grass with phosphates alone. The plots which have got no phosphate at all for many years, but only potash salts (plot 21), or nitrate of soda (plot 18), or both combined (plot 11), still continue to give a fair crop of grass, especially the last of these, so that the order of importance of these manurial constituents for the production of grass is seen to be, first, nitrate; second, potash; and third, phosphate. It is also evident that instead of nitrate of soda we may use sulphate of ammonia with equal advantage as regards quantity of crop. The guanos have done nothing worth speaking of in the way of producing grass. They are evidently not the kind of manures to apply to grass in dry seasons; and the most general result of the year is that in dry seasons the great desideratum for growing grass is a soluble

nitrogenous manure, such as nitrate of soda or sulphate of ammonia. Along with one of these, the other two constituents, potash and phosphate, will be of some use, but without it they are almost, if not altogether, useless.

#### BOTANICAL ANALYSES OF FOURTH YEAR'S GRASS.

On Tables V., VI., and VII. are shown the relative predominance of various species of grass, and the weights per cent and per acre of the different grasses and other kinds of herbage. The change that is going on in the character of the grasses all over the station is quite as rapid as during the three preceding years. The precise nature of the change will be seen from Table I., in which is given approximately the percentage of the various species by weight, grown over the whole station since the grass was sown four years ago.

TABLE I.—ALTERATION OF MEADOW GRASS IN FOUR YEARS.

	1888.	1889.	1890.	1891.
Ryegrass . . . . .	89	44	15	5.2
Cocksfoot . . . . .	...	12	25	47.6
Timothy . . . . .	5	12	7	5.3
Dogstail . . . . .	0.5	17	36	24.0
Foxtail . . . . .	...	0.2	...	0.3
Meadow grasses (poas) . . . . .	3	7.5	2.5	1.1
Fescues . . . . .	0.3	2.5	3	4.5
Yorkshire fog . . . . .	2.2	4.8	11.5	12.0
	100.0	100.0	100.0	100.0

In this table no account is taken of the clovers or other herbage. The first year's grass consisted of about 50 per cent ryegrass, 40 per cent clover, and only about 5 per cent of the natural grass. During the second year the red clover amounted to only about 5 per cent of the total herbage, and in the third year it was almost gone. In the third year's hay white clover began to appear, and in the fourth year it amounts to about 2 per cent of the herbage. About 97 per cent of the fourth year's hay consists of grasses proper, so that the last column of the table very nearly represents the actual proportions of the total hay crop.

The most notable change is the rapid disappearance of perennial (?) ryegrass. It may be that there is a perennial ryegrass, but it is quite evident that the grass sold under that name to

farmers is a very short-lived grass, which owes its name to the fact that it survives more than one year. Whether the small proportion of ryegrass still growing at Pumpherston is an enduring remnant of what was sown in 1887, or a fresh crop growing from the seed which falls from the hay during hay-making, I cannot say; but as there must always be a certain amount of seed sown on such occasions, it is very probable that the most of the ryegrass still persisting has been sown since 1887.

Scarcely less remarkable than the disappearance of ryegrass is the increase in the quantity of cocksfoot. It is now the predominating grass, so far as weight of hay is concerned. In my previous report I referred to the keen competition that was going on between cocksfoot and dogstail, and from the very rapid increase of the latter, which is the prevailing grass of the district, it seemed probable that in another year it would have taken the upper hand, but owing probably to the drought in the early part of 1891, it has received a check; but it remains to be seen whether, in the event of a more favourable season this year, it may be able to recover lost ground. The Yorkshire fog, which is a shallow-rooting grass, has also been checked in its onward course, probably from the same cause; while the deep-rooting tall-fescue has made a considerable advance. The meadow fox-tail, another deep-rooting grass, which had almost disappeared from the station, is once more appearing in small quantity.

It is probable that the figures in the above table may convey an erroneous idea to the minds of some readers, owing to the fact that they indicate weights of produce per cent. The different grasses vary enormously in their weight per plant, and therefore these figures convey no idea of the number of plants of each kind composing the herbage. The cocksfoot, with its large fruit-bearing head, is nearly ten times as heavy as a plant of ryegrass, so that the ryegrass as a plant is not so scarce on the station as one might suppose from the relative weights given in Table I. The number of plants per cent of each species for the last three years will show that very clearly (see Table II., p. 228).

This table shows that the crested dogstail plants are now nearly as numerous as they were the year before, and that, in fact, that species is now the most abundant on the station. Owing to the drought they have not been so well developed, but the plants are still very numerous. But the most striking fact brought out by this table is that the Yorkshire fog has increased more than any other species in the number of plants. They have more than doubled their proportion since the previous year, but as their weight shows no increase, we see that owing to the drought the plants must have been of a very poor,



light, stunted kind. This was observed at the time of taking the samples, and is clearly brought out by these figures.

TABLE II.—NUMBER OF PLANTS OF EACH SPECIES, PER CENT.

	1889.	1890.	1891.
Ryegrass . . . . .	61	34	21
Cocksfoot . . . . .	1.8	6	10.3
Timothy . . . . .	4.5	2	4
Dogstail . . . . .	13	32	31
Foxtail . . . . .	...	...	0.2
Meadow grasses . . . . .	13	7.5	4.5
Fescues . . . . .	2.6	6.5	5
Yorkshire fog . . . . .	4	11	25
	100.0	100.0	100.0

It would not be expedient to examine the various plots for the purpose of noticing the effects of the various manures applied upon the character of the herbage produced. Owing to the unfavourable nature of the season, the manures had very little opportunity of exerting their influence; and it would not be safe to draw from the experiment more than the general conclusions already noticed. The analyses of the grass on all the plots have been carefully made as usual, and the results are contained in Tables V., VI., VII., pp. 232-237, showing the number of plants of each species, and their weight per cent and per acre.

It remains to record the results obtained on plots 31 to 34, on which the effects of manuring with different proportions of nitrate of soda and sulphate of ammonia in different quantities are compared.

These four-rod plots are each divided into three parts, and they were manured as in the previous year—viz., in addition to the usual amount of phosphate and potash salts, they receive one, two, and three doses of nitrate of soda on plots 31 and 32, and of sulphate of ammonia in plots 33 and 34. In the case of the nitrate this treatment has been continued for three years in succession, and in the case of the sulphate for two years. The results are given on Tables VIII., IX., p. 238.

From these remarkable results we learn that the effect of manuring with soluble nitrogenous manures in various quantities is distinctly in favour of the larger application, and that the plots receiving it have produced the largest crops on the station;

but it is evident that the medium amount of soluble nitrogenous manure is the most economical.

As on former occasions, the grass of these plots was analysed to see if the increased crop was got at the expense of feeding quality. The experience of former years was that there was no deterioration in quality, but, on the contrary, a considerable improvement. The results in 1891 crop are given on Table X., p. 239.

Upon the whole, I incline to think that the feeding quality of the hay of the more heavily top-dressed plots, if not better than the others, is at least just as good; and we may safely say that the result of the heavy top-dressing has been to increase the amount of hay by one-half or more, without diminishing its feeding quality.

[TABLE III.

TABLE III.—HAY CROP, 1891.—*Manured Section, A and C.*

No. of Plot.	MANURES APPLIED.	SECTION.		Average.
		A.	C.	
	<i>Phosphatic Manures.</i>	Cwt. per acre.	Cwt. per acre.	Cwt. per acre.
5	Bone-meal	18	24	21
6	Dissolved bones	24	27	25½
7	Steamed bone-flour	30	21	25½
8	Thomas-slag	33	36	34½
9	Ground mineral phosphates	21	27	24
10	Superphosphate	30	36	33
11	No phosphate	24	..	24
12	Superphosphate alone . . . . .	9	..	9
	<i>Nitrogenous Manures.</i>			
13	Nitrate of soda	27	30	28½
14	Sulphate of ammonia	27	30	28½
15	Horn-dust	24	27	25½
16	Dried blood	21	21	21
17	No nitrogen	13½	..	13½
18	Nitrate of soda alone . . . . .	22½	..	22½
	<i>Potassic Manures.</i>			
19	Sulphate of potash	28½	25½	27
20	Muriate of potash	30	30	30
21	No potash	25½	..	25½
22	Potash salts alone . . . . .	13½	..	13½
	<i>Guanos.</i>			
23	Peruvian (with ammonia) . . . . .	13½	18	16
24	Fish . . . . .	21	16½	19
25	Ichaboe . . . . .	25½	12	19
27	Unmanured continuously . . . . .	3	9	6
	<i>Superphosphates.</i>			
28	27 % Soluble phosphate	21	27	24
30	36 % do do.	27	27	27
29	Unmanured since 1889 . . . . .	12	18	15
	<i>Complementary Manures.</i>			
11c	Phosphate alone . . . . .	..	15	..
12c	Nitrogen and potash (no phosphate) . . . . .	..	21	..
17c	Nitrogen alone . . . . .	..	25½	..
18c	Phosphate and potash (no nitrogen) . . . . .	..	21	..
21c	Potash alone . . . . .	..	15	..
22c	Phosphate and nitrogen (no potash) . . . . .	..	22½	..

TABLE IV.—HAY CROP, 1888, 1889, 1890, 1891.—*Unmanured Section B.*

No. of Plot.	Manures applied in 1878, 1879, 1881, 1882, 1883, 1884, AND 1885. (No Manures applied in 1886, 1887, 1888, 1889, and 1890. Nitrate of Soda, 1 cwt. per acre applied in 1891.)	Cwt. per acre.			
		1888.	1889.	1890.	1891.*
<i>Phosphatic Manures.</i>					
5	Bone-meal	27	24	24	18
6	Do. dissolved	28	27	27	24
7	Phosphatic guano	30	30	27	21
8	Do. do. dissolved	40	30	24	24
9	Ground mineral phosphates	21	27	27	27
10	Do. do. dissolved	31	27	30	24
11	No phosphates	22	27	25	15
12	Bone-ash alone . . . . .	14	21	12	24
<i>Nitrogenous Manures.</i>					
13	Nitrate of soda	26	27	29	24
14	Sulphate of ammonia	28	27	24	24
15	Horn-dust (shoddy 1878)	30	33	30	24
16	Dried blood	35	39	27	30
17	No nitrogen	26	30	26	24
18	Nitrate of soda alone . . . . .	16	24	20	24
<i>Potassic Manures.</i>					
19	Sulphate of potash	30	33	27	25½
20	Muriate of potash	25	33	19	19½
21	No potash	16	27	25	22½
22	Potash salts alone . . . . .	23	27	21	16½
<i>Guanos.</i>					
23	Peruvian guano . . . . .	22	30	30	22½
24	Fish guano . . . . .	35	33	18	19½
25	Ichaboe guano . . . . .	21	24	25	19½
27	Unmanured continuously . . . . .	9	14	13	15
<i>Superphosphates.</i>					
28	10% Soluble phosphate	31	24	18	18
29	25% do. do.	22	21	15	19½
30	40% do. do.	32	30	24	15

Nitrate of soda alone 1 cwt. per acre, 1891.

TABLE V.—HAY CROP, 1891. NUMBER OF GRASS PLANTS OF EACH SPECIES (PER CENT).

No. of Plot.	MANURES APPLIED.	Rye-grass.	Cocksfoot.	Timothy.	Dogs-tail.	Fox-tail.	Meadow-fescue.	Tall and Meadow Fescues.	Hard and Sheep's Fescues.	Yorkshire Fog.
<i>Phosphatic Manures.</i>										
5	Bone-meal	27.7	10.2	6.8	20.3	.6	11.3	1.1	1.7	20.3
6	Dissolved bones	36.6	8.0	7.0	13.5	.5	10.0	1.5	.4	22.5
7	Steamed bone-flour	15.2	8.7	2.1	17.3	...	4.9	2.7	.4	48.7
8	Thomas-slag	16.8	15.3	3.7	35.1	.7	5.1	2.9	.7	19.7
9	Ground mineral phosphate	13.5	10.6	1.2	34.1	...	1.8	.6	.6	37.6
10	Superphosphate	29.6	15.5	2.8	28.2	...	4.2	2.8	1.4	15.5
11	No phosphate	15.3	7.2	4.1	34.7	...	4.1	2.0	2.0	30.6
12	Superphosphate alone	22.7	1.8	1.1	47.3	...	2.6	1.8	2.6	20.1
<i>Nitrogenous Manures.</i>										
13	Nitrate of soda	22.6	11.6	2.3	28.3	...	8.7	1.7	.6	24.2
14	Sulphate of ammonia	15.8	11.1	2.3	31.6	.6	4.7	1.2	1.7	31.0
15	Horn-dust	15.6	5.3	2.1	18.1	.3	12.8	1.2	.4	44.2
16	Dried blood	36.6	10.9	2.7	17.5	.1	3.3	2.7	...	26.2
17	No nitrogen	29.1	12.1	1.8	30.2	.2	7.3	4.2	1.2	13.9
18	Nitrate of soda alone	33.3	3.9	6.9	35.4	.1	1.3	3.5	.9	14.7



TABLE VI.—HAY CROP, 1891. BOTANICAL ANALYSIS. WEIGHT OF DIFFERENT SPECIES OF GRASSES (PER CENT).

No. of Plot.	MANURES APPLIED.	Rye-grass.	Cocks-foot.	Timothy.	Dogs-tail.	Fox-tail.	Meadow grasses.	Tall and Meadow Fescues.	Hard and Sheep's Fescues.	York-shire Fog.	White Clover.	Weeds.
<i>Phosphatic Manures.</i>												
5	Bone-meal	6.5	49.3	10.1	14.6	.7	2.3	1.9	.4	9.3	4.7	.2
6	Dissolved bones	9.6	45.1	12.2	11.2	.9	2.3	2.2	.1	11.6	4.7	.1
7	Steamed bone-flour	3.7	45.8	3.7	13.2	...	1.1	3.7	.1	23.4	4.2	1.1
8	Thomas-slag	3.1	59.2	4.9	19.8	.6	.8	3.4	.2	7.2	.8	...
9	Ground mineral phosphate	3.1	50.3	2.2	23.7	...	.4	.9	.2	16.5	1.8	.9
10	Superphosphate	5.5	61.6	3.9	16.4	...	.7	2.8	.3	5.7	2.4	.7
11	No phosphate	4.0	39.3	7.3	27.7	...	.9	3.0	.5	15.7	1.1	.5
12	Superphosphate alone	8.2	14.0	2.9	52.4	...	.8	3.7	.8	14.4	1.9	.8
<i>Nitrogenous Manures.</i>												
13	Nitrate of soda	5.1	55.0	4.0	19.9	...	1.7	2.1	.2	10.9	.9	.2
14	Sulphate of ammonia	3.6	52.4	3.9	21.9	1.0	1.0	1.6	.4	13.9	.2	.1
15	Horn-dust	5.0	35.7	4.3	18.2	.5	3.6	2.5	.2	28.0	1.8	.2
16	Dried blood	8.8	55.7	4.6	13.1	.2	.7	3.5	...	12.4	.7	.3
17	No nitrogen	6.3	55.7	2.8	20.3	.3	1.4	4.9	.3	6.0	1.7	.3
18	Nitrate of soda alone	10.2	26.8	13.3	33.4	.2	.4	5.8	.3	8.8	.4	.4

<i>Potassic Manures.</i>													
19	Sulphate of potash	} With nitrogen and phosphate.	4.2	63.5	3.5	14.4	2.0	.6	2.2	.3	8.7	.6	...
20	Muriate of potash		7.4	53.1	7.4	15.7	.4	.4	4.1	.3	10.6	.6	...
21	No potash		9.5	42.7	7.7	32.3	...	.7	4.1	.8	1.8	.2	.2
22	Potash salts alone		5.0	32.0	8.7	31.6	.3	1.3	7.5	.3	9.0	4.0	.3
<i>Guanos.</i>													
23	Peruvian (with ammonia)	. . . . .	6.2	32.9	5.9	30.0	.2	.7	4.2	.2	16.7	2.8	.2
24	Fish	. . . . .	1.7	39.0	8.0	15.2	.6	1.7	5.6	.3	25.9	2.0	...
25	Ichaboe	. . . . .	3.8	33.7	12.5	17.3	.2	1.2	3.8	.3	21.8	1.2	1.0
27	Unmanured continuously	. . . . .	8.0	21.2	3.9	42.0	...	.5	10.0	1.5	10.4	.5	2.0
<i>Superphosphates.</i>													
28	27 per cent superphosphate	} With nitrogen and potash.	2.9	48.1	13.6	25.2	.3	.9	4.3	.6	2.9	1.2	...
29	36 per cent do.		4.0	49.2	3.3	32.8	.2	.8	3.3	.8	2.4	3.2	...
30	Unmanured since 1889		1.4	62.7	6.0	14.3	.8	.2	4.4	.5	9.2	.5	...
<i>Complementary Manures.</i>													
11c	Phosphate alone	. . . . .	3.6	33.6	4.5	32.7	...	.9	4.5	.2	16.4	1.8	1.8
12c	Nitrogen and potash (no phosphate)	. . . . .	3.0	35.7	9.6	32.0	.3	.6	3.0	.6	12.6	1.2	1.4
17c	Nitrogen alone	. . . . .	1.7	53.6	6.6	22.1	.3	.6	3.6	.6	5.3	.3	.3
18c	Phosphate and potash (no nitrogen)	. . . . .	4.0	53.9	4.2	14.4	.5	.5	6.0	.5	10.2	.7	.1
21c	Potash alone	. . . . .	6.2	43.3	4.2	22.7	.3	1.3	6.6	.7	12.4	2.0	.3
22c	Phosphate and nitrogen (no potash)	. . . . .	1.9	67.8	4.0	12.9	.4	.4	5.2	.2	6.8	.2	.2



TABLE VII.—HAY CROP, 1891. WEIGHTS OF DIFFERENT SPECIES (CWT. PER ACRE).

No. of Plot.	MANURES APPLIED.	Rye-grass.	Cock-foot.	Timothy.	Dog-tail.	Fox-tail.	Meadow Grasses.	Meadow and Tall Fescues.	Hard and Sheep's Fescues.	Holcus.	White Clover.	Weeds.
<i>Phosphatic Manures.</i>												
5	Bone-meal	1.1	9.2	1.8	2.6	.1	.4	.3	.1	1.6	.8	.03
6	Dissolved bones	2.3	10.8	2.9	2.6	.2	.9	.5	.02	2.7	1.1	.02
7	Steamed bone-flour	1.2	13.8	1.2	4.0	...	.8	1.2	.03	7.0	1.3	.03
8	Thomas-slag	1.0	19.5	1.6	6.5	.2	.3	1.1	.1	2.4	.3	...
9	Ground mineral phosphate	.6	10.6	.5	5.0	...	.1	.2	.04	3.4	.4	.2
10	Superphosphate	1.7	18.5	1.2	4.9	...	.2	.8	.1	1.7	.7	.2
11	No phosphate	1.0	9.4	1.7	6.7	...	.2	.7	.1	3.8	.3	.1
12	Superphosphate alone	.7	1.2	.3	4.7	...	.1	.3	.1	1.3	.2	.1
<i>Nitrogenous Manures.</i>												
13	Nitrate of soda	1.4	14.8	1.1	5.4	...	.5	.6	.05	2.9	.2	.05
14	Sulphate of ammonia	1.0	14.2	1.0	5.9	.3	.3	.4	.1	3.7	.05	.03
15	Horn-dust	1.2	8.6	1.0	4.4	.1	.9	.6	.05	6.7	.4	.05
16	Dried blood	1.8	11.7	1.0	2.8	.04	.1	.8	...	2.6	.1	.06
17	No nitrogen	.9	7.5	.4	2.7	.04	.2	.7	.04	.8	.2	.04
18	Nitrate of soda alone	2.5	6.0	2.9	7.5	.04	.1	1.3	.06	1.9	.1	.1



TABLE VIII.—TOP-DRESSING WITH NITRATE OF SODA, PER ACRE.

Manure	144 lb. per acre.		288 lb. per acre.		432 lb. per acre.	
Plot	31	32	31	32	31	32
	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
1889 . .	33	36	39	42	48	48
1890 . .	33	37½	36	40½	55½	48
1891 . .	31	24	37½	36	37½	45
Average .	32	32	37½	39½	47	47

TABLE IX.—TOP-DRESSING WITH SULPHATE OF AMMONIA, PER ACRE.

Manure	120 lb. per acre.		240 lb. per acre.		360 lb. per acre.	
Plot	33	34	33	34	33	34
	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
1890 . .	30	31½	54	45	57	48
1891 . .	22½	19½	33	37½	42	39
Average .	26	25	43½	41	49½	43½

TABLE X.—EFFECT OF SOLUBLE NITROGENOUS MANURES ON THE FEEDING QUALITY OF HAY.

	Nitrate of Soda.					
Per acre	144 lb.		288 lb.		432 lb.	
Plot	31	32	31	32	31	32
Moisture . . .	10.90	11.40	11.50	11.55	11.85	12.80
Albumen . . .	3.72	3.94	3.28	4.37	4.37	4.37
Amides, &c. . .	1.35	1.31	2.63	1.75	3.50	1.54
Carbohydrates, &c. .	53.08	55.39	52.59	51.63	49.73	49.76
Woody fibre . . .	24.30	24.40	23.30	23.50	23.20	24.05
Ash . . . . .	6.65	6.40	6.70	7.20	7.35	7.50
	100.00	100.00	100.00	100.00	100.00	100.00

	Sulphate of Ammonia.					
Per acre	120 lb.		240 lb.		360 lb.	
Plot	33	34	33	34	33	34
Moisture . . .	10.45	10.40	10.75	11.15	11.60	11.60
Albumen . . .	3.94	3.28	4.37	3.94	5.25	5.25
Amides, &c. . .	1.31	1.97	1.54	1.75	2.19	1.31
Carbohydrates, &c. .	53.58	53.75	53.84	52.76	50.11	50.84
Woody fibre . . .	24.45	24.55	23.10	23.45	23.10	24.15
Ash . . . . .	6.05	6.05	6.40	6.95	7.75	6.85
	100.00	100.00	100.00	100.00	100.00	100.00

## FEEDING EXPERIMENT

TO DETERMINE THE RELATIVE VALUE AS FODDER OF  
RYEGRASS EATEN GREEN AND AFTER BEING MADE  
INTO HAY.

It is frequently asserted and generally believed that grass cut green and soiled to cattle is a more nutritious diet than hay, and this superiority has been attributed by some to the succulent nature of the grass rendering it more easily digestible, and by others to the loss of nutritive constituents sustained by the hay during the process of curing. Careful experiments made in Germany by E. Wolff, G. Kühn, Weiske, and others, have indeed shown that, in the case of clover and lucerne, there is a diminution in the digestibility of the nutritive matters to the extent of from three to five per cent when made into hay, even under more favourable conditions than can occur in ordinary farm practice. That there may be a great loss of nutritive matter and a reduced digestibility in the case of hay that has been subjected to bad weather during hay-making is, of course, admitted on all sides. Even with every care, some loss through breakage of the more tender parts of hay, such as the leaves of clover and the seeds of grasses which remain on the field, cannot be avoided. But, admitting all that, there still remains the question whether cattle make better progress on grass or on the hay made from it, when allowed to eat as much as they like of both fodders.

That is the practical question which chiefly interests the farmer, for even admitting that there is a loss of nutritive constituents in converting grass into hay, and a deterioration of the digestibility of the fodder, whereby ten per cent or more of the feeding value of the crop is lost, it may be that there are other circumstances which render hay more appropriate as a fodder for feeding stock, so that the loss sustained in making it may be more than counterbalanced. It was to test this question that the following experiment to determine the relative value of grass and hay was undertaken.

It need hardly be said that in making such an experiment it is in the first place necessary that the grass and the hay made from it be of the same period of growth, and in every respect similar, except that the one is eaten green, and the other eaten dry.

The experiment was carried out by Mr John Milne on his farm at Mains of Laithers. A two-year-old Irish ox was chosen

for the purpose, and he was put into the stall used in last year's experiments, and described on p. 204 of the former volume of the 'Transactions.' It need only be said here that it is so constructed as to enable an accurate record to be kept of the food consumed, and of the dung and urine voided.

The general plan of the experiment was to feed the ox for a month on grass which was cut daily, and in the following month to feed him on the hay which was made from precisely the same kind of grass as was eaten during the preceding month. For this purpose, 300 lb. of grass was cut each day at 2 P.M., when it was as free from dew as possible: one-half of it was taken to the stall, and the other half was made into hay on the field with great care. As soon as the hay of the first three days' cutting was sufficiently cured to keep, it was taken to the barn and put up in a small coil. The hay from the next three days' cutting was treated in a similar manner, and so on with the rest for thirty days.

Ten coils of hay were thus preserved, each containing three days' fodder, and when the month was ended the hay was fed to the ox, coil after coil, in the same order in which it had been cut, so that the fodder in the first month was the same as that in the second, with the sole difference that, in the former case, it contained all its natural moisture, and in the latter it did not.

The crop was Italian ryegrass without clover, and fortunately the weather during the month was on the whole favourable, so that the hay was saved in good condition. During the whole course of the experiment, the ox was given two pounds of linseed-cake daily.

On Table I., p. 252, a record is given of the grass, cake, and water consumed, and of the dung and urine voided daily; and on Table II., p. 253, a record for the second month, when the hay was consumed.

When the hay had been consumed, a third experiment was carried out during the next month, when the ox was fed on a mixture of tares, beans, and oats, cut green. The record of this period is given on Table III., p. 254.

#### GRASS-FEEDING PERIOD.

The experiment began upon 19th June, after the animal had been kept for a week on the grass, and had become accustomed to its stall and its diet. Its weight was at that date 11 cwt. 3 qrs. 21 lb., and was afterwards taken once a-week, and sometimes on three consecutive days, so as to secure accuracy.

The quantities of grass eaten fluctuated from day to day, from 58½ lb. to 82½ lb., and the amount of water taken daily fluctu-

ated even more widely; but the weekly average was pretty constant, viz., about 69 lb. of grass and 27 lb. of water—not quite 100 lb. in all. The progress of the experiment during the four weeks is shown on Table IV.

TABLE IV.—PROGRESS DURING GRASS-FEEDING PERIOD.

	Consumed daily.			Discharged daily.		Increase in live-weight weekly.
	Linseed-cake.	Grass.	Water.	Dung.	Urine.	
First week	lb. 2	lb. 70	lb. 24	lb. 41	lb. 17	lb. 4
Second "	2	68	31	49	15	17
Third "	2	75	24	60	10	4
Fourth "	2	66	30½	60	7½	20
Average	2	70	27	52	12¼	11¼

The increased weight of grass consumed during the third week is evidently due to adherent moisture and not to the grass itself; for while the ox ate daily 7 lb. more grass during the third than during the second week, it drank daily exactly 7 lb. less water.

The weight of dung voided daily rapidly increased during the first two weeks, and thereafter remained fairly uniform; but the most important circumstance in the progress of the month is the rapid diminution in the daily amount of urine.

It may at first sight appear strange, that during the fourth week, when the ox was eating least grass and voiding most dung, it should, nevertheless, be increasing most in live-weight. But there are many things to be considered before we can obtain a correct knowledge of the progress of a feeding experiment. Chief among these is the large and fluctuating amounts of water contained in the fodder and in the dung. Deducting the water contained in these, we obtain the following quantities of dry matter consumed, discharged, and digested daily during the four periods.

	Solids in fodder.		Solids in dung.	Solids digested daily.
	Cake.	Grass.		
	lb.	lb.	lb.	lb.
First week . . .	1.7	18.9	5.2	14.8
Second " . . .	1.7	19.0	6.0	14.7
Third " . . .	1.7	20.7	7.8	14.6
Fourth " . . .	1.7	21.7	7.7	14.3

We thus see that, despite the fluctuations in the quantities of food eaten and dung discharged, there was a steady increase in the solid matter consumed daily, and a more than proportionate increase in the solids of the dung; and we thus obtain the remarkable results in the fourth column, which inform us that the amount of solids digested daily was very constant, but nevertheless gradually diminishing during the period. It is quite evident from these results that the grass rapidly diminished in digestibility from week to week. If we assume, as we may from the results of many experiments, that about 80 per cent of the dry matter of the linseed-cake was digested, and if we subtract it from the total digested matter, we obtain the quantities of grass digested daily during the four periods, and also the digestibility of the total organic matter of grass at the four periods of its growth, viz. :—

	Dry matter consumed daily.	Dry matter digested daily.	Digestibility of grass.
	lb.	lb.	per cent.
First week . . .	18.9	13.4	71
Second " . . .	19.0	13.3	70
Third " . . .	29.7	13.2	64
Fourth " . . .	21.7	12.9	60

Not only did the digestibility of the grass diminish from week to week, but also its feeding quality deteriorated.

The composition of the grass altered from the beginning to the end of the first period, as is shown by the following analysis :—

	Beginning.	Middle.	End.
Moisture . . . .	72.8	69.5	66.2
Dry matter . . . .	27.2	30.5	33.8
	<hr/> 100.0	<hr/> 100.0	<hr/> 100.0
Dry matter contained—			
Albumen . . . .	5.25	4.03	3.06
Amides, &c. . . .	.66	1.00	1.75
Ether extract . . . .	2.15	1.84	1.15
Carbohydrates, &c. . . .	61.59	62.01	61.89
Woody fibre . . . .	24.20	25.50	26.90
Ash . . . .	6.15	5.62	5.25
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00

It is seen that the grass became less juicy and more woody as it advanced towards maturity; but the most notable change consisted in the rapid diminution of albumen, and the increase of the non-albuminoid nitrogenous matter ranked under the item amides, &c. These substances are reckoned in the above analyses into their equivalent of albumen, but they must not be regarded as equal to albumen in feeding value. It seems,



from experiments made to determine their feeding value, that they do to some extent assist in diminishing the amount of albuminoid waste in feeding animals; but from their uncertain composition in various fodders, and the lack of any definite value attachable to them, it is impossible to say precisely how much inferior in feeding value the sample taken at the end of the month is to that taken at the beginning. The data available from the results of this experiment cannot be used to determine their value, as it would not be safe to rely on the results obtained with one feeding animal.

Thus far we have seen that the ox was consuming rather less solid food as the month went on, and that its food was gradually becoming less nutritious. We should therefore expect the animal to fall away in weight and condition; but the weekly weighings show that it was increasing in weight, and even rapidly increasing, at the stage when the consumed solids were least and also least nutritious. In order to find some explanation of this apparent anomaly, we must inquire what becomes of the solid matter consumed as food. It goes to supply and make good the bodily waste, and the bodily waste is contained in the products of respiration and in the urine. An examination of the urine will therefore be of great use in attempting to explain the difficulty.

The rapid diminution of the flow of urine as the month progressed is the most noteworthy fact in the experiment, and also very remarkable is the change which occurred in the composition of the urine. The urine was carefully sampled and sent to me, that the nitrogen it contained might be estimated, and the following are the results:—

DAILY LOSS OF NITROGEN IN URINE.—FIRST PERIOD.

	Urine. lb.	Nitrogen. per cent.	Nitrogen. lb.
First week . . .	17	...	.160 (?)
Second " . . .	15	.81	.121
Third " . . .	10	.68	.068
Fourth " . . .	7.5	.77	.058

Unfortunately the sample of the first week's urine was not tested, so that an interesting item is thus wanting; but what we have is quite sufficient to show how great was the diminution in the concentration as well as in the quantity of the urine as the month went on. The daily loss of nitrogen by the urine in the first week would be considerably more than during the second week, and we may fairly assume it to be .160 lb.

There was thus about three times more nitrogen contained in the urine during the first week than during the last, and the importance of that will be seen from Table V., where the total amounts of nitrogen consumed and discharged are contrasted.

TABLE V.—TOTAL NITROGEN CONSUMED AND DISCHARGED DAILY.—  
FIRST PERIOD.

	Consumed.			Discharged.			Retained.
	Cake.	Grass.	Total.	Dung.	Urine.	Total.	
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
First week	.089	.176	.265	.096	.160(?)	.256(?)	.009(?)
Second "	.089	.152	.241	.107	.121	.228	.013
Third "	.089	.165	.254	.115	.068	.183	.071
Fourth "	.089	.168	.257	.097	.058	.155	.102

It is thus evident that the ox was parting with nearly all the albumen it was consuming during the first week, when the flow of urine was most abundant and richest in nitrogenous matter. Towards the end of the month it was storing up in its tissues one-tenth pound of nitrogen daily, which represents over half a pound of albumen, or not far short of three pounds of flesh. Regarding the loss by respiration and perspiration, nothing can be said, as means were not available to determine it, so that there is no check upon the carbonaceous waste products. The chief lesson provided by the observations of the first month is, that the greater the flow of urine the greater is the amount of nitrogenous waste—that is to say, albuminoid waste, or, in other words, the waste of flesh, or of flesh-forming material. The quantity of urine voided is beyond a certain minimum dependent on the excess of water consumed, and it is evident that the ox took more water than was desirable during the first two weeks, and this was probably the result of thirst induced by the nature of the young grass.

#### HAY-FEEDING PERIOD.

During the next month, while the ox was feeding day by day on the hay that had been made exactly one month previously, there were the usual daily fluctuations in the quantity consumed; but looking at the averages, the amount eaten daily decreased from week to week, and the daily amount of water taken diminished even more rapidly.

As regards the discharges, it has to be noted that those of the first week differ much from the three following weeks, for the reason that they practically refer to the food consumed the week previously. It takes nearly a week for the undigested

food to travel slowly through the long alimentary tract of an ox, and be wholly discharged therefrom, and we must therefore regard the first week of the second month as a preliminary period, during which the animal is getting into equilibrium with its diet. In drawing a comparison between the two periods, we ought therefore to confine our attention to the last three weeks, and in these we notice that, while the amount of dung discharged fluctuated a little, it may be reckoned at about 49 lb. per day, while the urine rapidly diminished from  $7\frac{2}{3}$  lb. daily during the first week to  $3\frac{3}{4}$  lb. daily during the last week (see Table VI.)

TABLE VI.—PROGRESS DURING HAY-FEEDING PERIOD.

	Consumed daily.			Discharged daily.		Increase in live-weight weekly.
	Cake.	Hay.	Water.	Dung.	Urine.	
First week	2	$31\frac{1}{3}$	$67\frac{1}{2}$	54	$11\frac{1}{2}$	2
Second "	2	$28\frac{1}{2}$	$59\frac{1}{2}$	$48\frac{1}{2}$	$7\frac{2}{3}$	33
Third "	2	27	56	$52\frac{3}{4}$	$5\frac{1}{3}$	8
Fourth "	2	$23\frac{3}{4}$	47	45	$3\frac{3}{4}$	11
Average	2	28	58	50	7	$13\frac{1}{2}$

We thus see that, speaking generally, the discharges of the ox, after being fed for a fortnight on grass, amounted to about 60 lb. of dung and 10 lb. of urine daily, while after being fed for a fortnight on the hay made from it, they amounted to about 50 lb. dung and about 5 lb. of urine daily. This difference is chiefly accounted for by the greater amount of water consumed during the former period. The total amount of water consumed during the first month, including the total moisture in the food as well as the water drunk, was 75 lb. daily on an average, while during the last three weeks of the second month it was 61 lb. daily.

In the last column of Table II. are given the equivalents in grass of the hay eaten daily during the four weeks, from which it is seen that the ox ate daily, during the first month,  $69\frac{1}{2}$  lb. grass, and during the second month it ate hay equal to 75 lb. grass daily. There was thus the equivalent of  $5\frac{1}{2}$  lb. grass to the credit of the hay-making period; but against that has to be put the deterioration the fodder sustained in being converted from grass into hay, as is shown in the following analyses of samples at the beginning and end of the second period:—

## ANALYSES OF HAY.

	First week.	Fourth week.
Moisture . . . . .	28.40	25.03
Solids . . . . .	76.60	74.97
	<hr/>	<hr/>
	100.00	100.00
Solids contained—		
Albumen . . . . .	4.81	2.41
Amides, &c. . . . .	1.10	1.53
Ether extract . . . . .	2.30	3.35
Carbohydrates, &c. . . . .	55.19	58.81
Woody fibre . . . . .	29.65	28.55
Ash . . . . .	6.95	5.35
	<hr/>	<hr/>
	100.00	100.00

When these analyses of hay are compared with those of the grass to which they correspond (p. 243), it is seen that the albumen and also the carbohydrates have suffered a good deal in the process, and the deterioration in feeding quality may be as much as 10 per cent, so that the increase in the quantity of fodder eaten as hay, amounting to about 8 per cent, may not compensate it.

It would seem, however, that the ox made better progress in the second month, if we may trust to the weighings as a guide; though I am by no means sure that we can do so in this case. Indeed it is highly probable that the weight of the ox at the beginning of the grass period was overestimated; for during the preliminary period it gorged itself with the young grass, so that its real live-weight may well have been 10 lb. lighter than is indicated by the first weighing, and the progress during the second month may have been equal to that of the first. Properly speaking, the progress during the second month ought to have been less, as the amount of nourishment taken was less; but here again we have to consider one notable difference in the results of the two months' feeding, which is bound to have had a marked effect—viz., the quantity of urine passed during the second period was not much more than half that passed in the first, and if the urine was not all the more concentrated, that must mean that there was less loss of flesh material than during the former month. The following shows exactly how that matter stood:—

## DAILY LOSS OF NITROGEN IN URINE.—SECOND PERIOD.

	Urine. lb.	Nitrogen. per cent.	Nitrogen. lb.
First week . . . . .	11.5	.69	.079
Second " . . . . .	7.66	.88	.067
Third " . . . . .	5.33	.90	.048
Fourth " . . . . .	3.75	.95	.036

It will thus be seen that the nitrogen lost in the urine during the hay-feeding month was not much more than half that lost during the preceding month, when the corresponding grass was eaten. The result of this diminished waste is shown on Table VII., where, as in the former period, the total nitrogen consumed and discharged are compared.

TABLE VII.—TOTAL NITROGEN CONSUMED AND DISCHARGED DAILY.—  
SECOND PERIOD.

	Consumed.			Discharged.			Retained.
	Cake.	Grass.	Total.	Dung.	Urine.	Total.	
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
First week	.089	.229	.318	.127	.079	.206	.112
Second "	.089	.152	.241	.109	.067	.176	.065
Third "	.089	.140	.229	.103	.048	.151	.078
Fourth "	.089	.120	.209	.092	.036	.128	.071

During the first week, owing to the large amount of nutritious young hay eaten, the ox retained a greater quantity of nitrogen in its body than at any other time during the course of the experiment; but thereafter it got into a state of greater equilibrium with its diet, and even in the last week, when it ate less of the hay, which was maturer and of poorer quality, and evidently less appetising, it still retained the normal quantity of nitrogen in its tissues; a result brought about by the comparatively small amount of nitrogen lost in the scanty flow of urine, which fell during the last three days to less than 3 lb. daily.

The results of the second month's feeding tend to emphasise the lesson taught by the first month's feeding—viz., that the progress of a feeding ox is very materially aided by providing it with a diet which contains little water, whereby the flow of urine is reduced to a proper minimum.

I am of opinion that the general practice of cattle-feeding in this country errs upon the side of providing stock with too watery a diet, whereby much valuable food is lost in urine which ought to be stored as flesh.

In an experiment of such short duration, in which only one animal is concerned, it would be a mistake to rely too absolutely on the accuracy of the information it provides. It may be that the results arrived at are more favourable to dry feeding than they ought to be, owing to the difficulty of obtaining an accurate measure of an animal's live-weight while unfasted. Observations recorded in the 'Transactions' during the last two years

show how variable from day to day is the weight of a feeding ox, and how essential it is to have a number of animals employed in any experiment where somewhat fine distinctions are to be drawn; as in the above experiment, where a few pounds up or down at the beginning and end of a month's feeding may very materially affect the reliability of the result obtained. It must be acknowledged, however, that in this particular case the information yielded by the weigh-bridge is entirely supported by the result of the numerous analyses of carefully taken samples which accompanied the whole course of the experiment, and that there is sufficient evidence in favour of dry feeding to encourage those who are interested in the subject to test it on a larger scale in ordinary practice.

In making such an experiment it would be impracticable to make hay day by day during the grass-feeding month, for, apart from the inconvenience of the thing, it would not be a practical test in the sense of obtaining information that could be translated into ordinary practice. There can be no doubt that the hay used in the above experiment suffered a good deal from having to be made in unfavourable weather, so that the results of the hay-feeding month are not so good as in better circumstances they would have been. It would sufficiently meet the requirements of the experiment on a large scale if the hay were cut in the middle of the grass-feeding month, or a day or two earlier. By that means the hay would have a composition approaching the average composition of the grass eaten. It would manifestly not be a fair comparison if the grass were not cut for hay until the latter part of the month, when it had become somewhat woody and less nutritious than the average grass.

### THIRD PERIOD.

Towards the close of the second period Mr Milne suggested that the animal might be put back upon green fodder for a month, and he proposed that it should be fed upon a mixture of tares, beans, and green oats, which he had at hand. I cordially approved of the suggestion, and it was carried out with the same care and under the same analytical control as before. The results of the month's feeding are given on Table III., p. 254, and it will be seen that although the fodder was of a highly nitrogenous kind, the animal made no progress whatever.

Owing to that circumstance it is unnecessary to follow the progress of the experiment from week to week. It will suffice to give the average results of the whole month in a few words.

The average quality of the fodder and dung were as follows:—

	Fodder.	Dung.
Moisture . . . . .	83.40	85.96
Dry matter . . . . .	16.60	14.04
	<hr/>	<hr/>
	100.00	100.00
Dry matter contained—		
Albumen . . . . .	14.87	9.19
Amides, &c. . . . .	7.00	2.81
Ether extract . . . . .	3.30	3.05
Carbohydrates . . . . .	46.43	43.93
Woody fibre . . . . .	20.70	29.45
Ash . . . . .	7.70	12.20
	<hr/>	<hr/>
	100.00	100.00

The ox ate on an average 104 lb. tares and 2 lb. linseed-cake daily, containing respectively 2.57 lb. and .54 lb. of albumen. It voided daily 56½ lb. dung, containing .73 lb. albumen. There was thus 2.38 lb. albumen digested daily; and if we assume as before that 80 per cent of the albumen in the cake was digested, .43 lb. of the digested albumen was derived from the cake, leaving 1.95 of albumen derived from the tares, &c., which was digested daily. The digestibility of the albumen of the tares, &c., was therefore 76 per cent. The diet was therefore very digestible, and with so large an amount of nitrogenous food consumed and digested it might be supposed that the ox would make rapid progress, and we have to discover why it did not.

In the first place, the success of a diet does not depend solely on the amount of albumen consumed by the feeding animal. All experiment goes to prove that there is a certain ratio of albumen to non-albuminous matter in the digestible constituents of a fodder which is most favourable to progress, and that ratio depends on a number of circumstances which need not be discussed here. In the present case, a ratio of about 1 to 5 or 6 would be considered as close a ratio as it would be profitable to employ; but we find that the above-mentioned diet had a ratio of about 1 to 3 or less, so that it contained at least twice as much albumen or half as much carbohydrates as experience has shown to be most suitable. Feeding on such a diet, the ox was compelled to supply itself with the carbonaceous matter required for its proper nourishment in great measure from the albumen of its food, instead of from less expensive food constituents, such as starch, sugar, and the like. Such a diet is not economical; but the question before us is not the economical aspects of the feeding: the question is, Why did the ox not make progress, despite the fact that it had presented to it a fodder of what would be considered a most nutritious kind, and that it was permitted to take as much of it as it liked? Either the food must not have been of a fattening kind, or the

animal must not have been able to take a sufficient quantity of it, or both these conditions may have been present. In the former case, since the ox was not losing weight, it would probably be losing fat, and compensating that loss by a gain in flesh. If that were so, the analysis of the fodder consumed and the dung and urine discharged would show that more nitrogen was consumed than was discharged.

The analysis of the fodder shows that the ox was consuming .6 lb. nitrogen daily, while the analysis of the dung and urine show that it was parting with .14 lb. nitrogen in the former, and .38 lb. of nitrogen in the latter, leaving a balance of .08 lb. nitrogen, which must have been retained in the animal's tissues. The ox must therefore have been gaining flesh and losing fat in nearly equal proportions daily. Had it been able to consume more food, it would have gained weight; but the large amount of water contained in the tares put a limit to the amount of fodder it could consume. The total amount of dry organic matter in its daily food was less than 18 lb., or fully 2 lb. less than during the previous month.

It parted with 20 lb. urine daily on an average, or about three times as much as during the previous month. Altogether the kind of food provided during the third period was unsuitable for a feeding ox. It contained too high a proportion of albumen, too little carbohydrates, and too much water.

Mr Milne supplies the following further particulars: The ox was kept for other twenty-three days upon a similar mixture of tares, beans, and green oats, but later sown and not so ripe; with the result that during the whole period of fifty-one days of tare-feeding the average increase was only .53 lb. per day. It was then fed for twenty-eight days upon a mixture of 4 lb. of cake and meals, with pulped turnips, when its weight increased to 13 cwt. 2 qrs. 14 lb., or a gain of 2 lb. per day. It was then slaughtered, and after deducting 14 lb. for green weight, it weighed 7 cwt. 2 qrs. 14 lb. = 56 per cent of the live weight. The small increase made when fed upon the mixture of tares, beans, and green oats must have been owing to the too nitrogenous quality of the food. Had there been a larger proportion of green oats in the mixture, the results might have been more favourable. Probably the results would have been better, if along with the tares, maize, grain, or locust-beans had been given instead of the linseed-cake.



TABLE I.—DAILY CONSUMPTION AND DISCHARGES OF OX FED ON  
FRESHLY CUT ITALIAN RYEGRASS.

	Lin- seed- cake.	Grass.	Water.	Dung.	Urine.	Live- weight.
June	lb.	lb.	lb.	lb.	lb.	cwt. qr. lb.
19	2	80	18	39	13	11 3 21
20	2	80	24	39	20	
21	2	80	27	39	17	
22	2	59	32 $\frac{3}{4}$	43	14	
23	2	60	32 $\frac{1}{2}$	38	17	
24	2	60	16	43	20	
25	2	69	16 $\frac{1}{2}$	44 $\frac{1}{2}$	16	11 3 25
Average	2	70	24	41	17	
June						
26	2	70	34 $\frac{1}{2}$	45	15 $\frac{1}{2}$	
27	2	68	35	44	15 $\frac{1}{2}$	
28	2	63	33 $\frac{1}{2}$	47	13 $\frac{1}{2}$	
29	2	70	28	52	18	
30	2	61 $\frac{1}{2}$	34	52	14 $\frac{1}{4}$	
July						
1	2	69 $\frac{1}{2}$	28	50	11 $\frac{1}{2}$	12 0 14
2	2	75 $\frac{1}{2}$	23 $\frac{1}{2}$	50	18	
Average	2	68	31	49	15	
July						
3	2	82 $\frac{1}{2}$	...	59	12	12 0 18
4	2	75 $\frac{1}{2}$	33 $\frac{1}{4}$	52	12 $\frac{1}{4}$	
5	2	73	35	55 $\frac{1}{4}$	10	
6	2	67	27 $\frac{3}{4}$	63 $\frac{1}{4}$	9 $\frac{1}{4}$	
7	2	73	25 $\frac{1}{2}$	66 $\frac{1}{4}$	8 $\frac{1}{2}$	
8	2	69 $\frac{1}{2}$	31 $\frac{1}{2}$	60	8	
9	2	76 $\frac{1}{2}$	15	63 $\frac{1}{2}$	9 $\frac{1}{4}$	
Average	2	75	24	60	10	
July						
10	2	82 $\frac{1}{2}$	23	63	6 $\frac{1}{2}$	12 1 10
11	2	64 $\frac{1}{4}$	23 $\frac{1}{2}$	59	10 $\frac{1}{2}$	
12	2	58 $\frac{1}{2}$	33	63	5	
13	2	59 $\frac{1}{2}$	47	56	6 $\frac{3}{4}$	
14	2	63 $\frac{1}{2}$	43 $\frac{1}{2}$	60 $\frac{1}{2}$	8 $\frac{1}{4}$	
15	2	69	17 $\frac{1}{2}$	64	10	
16	2	68	26 $\frac{1}{2}$	54 $\frac{1}{2}$	6	
Average	2	66	30 $\frac{1}{2}$	60	7 $\frac{1}{2}$	
Total	56	1946	766	1470	346	

TABLE II.—DAILY CONSUMPTION AND DISCHARGES OF OX FED ON  
HAY MADE FROM RYEGRASS.

	Lin- seed- cake.	Hay.	Water.	Dung.	Urine.	Grass equivalent of Hay.	Live-weight.
	lb.	lb.	lb.	lb.	lb.	lb.	cwt. qr. lb.
July							12 1 10
17	2	33	67	52 $\frac{1}{2}$	11 $\frac{1}{2}$		
18	2	34 $\frac{1}{2}$	83	55 $\frac{3}{4}$	10 $\frac{1}{2}$		
19	2	31 $\frac{1}{2}$	75	61	12 $\frac{1}{2}$		
20	2	28 $\frac{1}{2}$	51 $\frac{1}{2}$	57 $\frac{1}{2}$	11 $\frac{1}{2}$		
21	2	29 $\frac{1}{2}$	64 $\frac{1}{2}$	57 $\frac{1}{2}$	10 $\frac{1}{2}$		
22	2	30 $\frac{3}{4}$	83	46	11 $\frac{1}{2}$		
23	2	32	48 $\frac{1}{2}$	52	13		12 1 12
Average	2	31 $\frac{1}{2}$	67 $\frac{1}{2}$	54	11 $\frac{1}{2}$	84	
July							
24	2	28	51	44 $\frac{1}{2}$	9		
25	2	30 $\frac{1}{2}$	62	50	9		
26	2	29 $\frac{1}{2}$	56 $\frac{1}{2}$	47 $\frac{1}{2}$	7 $\frac{1}{2}$		
27	2	29	56 $\frac{1}{2}$	48 $\frac{1}{4}$	7 $\frac{1}{4}$		
28	2	24	61 $\frac{1}{4}$	51	9 $\frac{1}{2}$		
29	2	27 $\frac{1}{2}$	66 $\frac{1}{2}$	45 $\frac{3}{4}$	5 $\frac{3}{4}$		
30	2	30 $\frac{3}{4}$	62 $\frac{1}{4}$	51 $\frac{1}{4}$	5 $\frac{1}{4}$		12 2 17
Average	2	28 $\frac{1}{2}$	59 $\frac{1}{2}$	48 $\frac{1}{8}$	7 $\frac{2}{8}$	79	
July							
31	2	28 $\frac{3}{4}$	62	57 $\frac{3}{4}$	7 $\frac{1}{2}$		
Aug.							
1	2	30 $\frac{1}{2}$	45 $\frac{1}{2}$	56	7 $\frac{1}{4}$		
2	2	25 $\frac{3}{4}$	56 $\frac{3}{4}$	49 $\frac{1}{2}$	7		
3	2	30 $\frac{3}{4}$	59 $\frac{3}{4}$	54 $\frac{1}{2}$	4		
4	2	28	55	46 $\frac{1}{2}$	5 $\frac{3}{4}$		
5	2	24 $\frac{3}{4}$	55 $\frac{1}{2}$	50	3 $\frac{1}{4}$		
6	2	21	55 $\frac{1}{2}$	55	2 $\frac{1}{4}$		12 2 25
Average	2	27	56	52 $\frac{3}{4}$	5 $\frac{1}{8}$	77 $\frac{1}{4}$	
Aug.							
7	2	22	45	45 $\frac{1}{2}$	4 $\frac{1}{2}$		
8	2	22	38 $\frac{1}{2}$	45 $\frac{3}{4}$	4		
9	2	21 $\frac{1}{2}$	61	40 $\frac{1}{2}$	4		
10	2	23 $\frac{1}{2}$	41 $\frac{1}{2}$	51	5		
11	2	27 $\frac{1}{2}$	46	41 $\frac{3}{4}$	1 $\frac{3}{4}$		
12	2	22 $\frac{3}{4}$	39 $\frac{3}{4}$	46	3 $\frac{1}{2}$		
13	2	26 $\frac{1}{2}$	57	46	2 $\frac{1}{2}$		12 3 8
Average	2	23 $\frac{3}{4}$	47	45	3 $\frac{3}{4}$	61	
Total	56	774	1606	1400	197	2109	

TABLE III.—DAILY CONSUMPTION AND DISCHARGES OF OX FED ON A MIXTURE OF TARES, BEANS, AND OATS, ALL CUT GREEN.

	Lin- seed- cake.	Tares.	Water.	Dung.	Urine.	Live- weight.
Aug.	lb.	lb.	lb.	lb.	lb.	cwt. qr. lb.
21	2	106	...	60	20	12 3 7
22	2	124	...	58	31	
23	2	123	...	60½	37	
24	2	124	...	53	41½	
25	2	98	...	51½	23	
26	2	112	...	50½	23½	
27	2	108	...	52	32	12 3 15
Average	2	113½	...	55	30	
Aug.						
28	2	97	21	56	12½	
29	2	84	...	58	17	
30	2	91	...	54	15½	
31	2	111	...	64½	12	
Sept.						
1	2	100	...	61½	9	12 3 6
2	2	110	19	57	9	
3	2	99½	...	71½	9½	
Average	2	99	...	60	12	
Sept.						
4	2	76	...	56	12½	12 3 12
5	2	93	...	46½	12	
6	2	85	30½	48½	9	
7	2	76	33	56½	14½	
8	2	108½	...	59	20	
9	2	99	...	60	17½	
10	2	117	...	51½	18	
Average	2	97	...	55½	14½	
Sept.						
11	2	102	...	48	22½	
12	2	125	...	58½	20	
13	2	78	...	53	19	
14	2	89	...	61	21½	
15	2	124	...	57½	19½	
16	2	126	...	54½	30½	
17	2	111	...	55½	43½	
Average	2	108	...	55½	25	
Total	56	2896	103½	1573	572	

## AGRICULTURAL EXPERIMENTS BY LOCAL SOCIETIES.

The field experiments carried out annually in various parts of Scotland under the auspices of the Highland and Agricultural Society, have for their object the diffusion of practical knowledge amongst farmers regarding the application of manures, to discover what are the kinds and quantities of manure most suitable and profitable to employ for various crops and in different circumstances, and the best methods of applying them. The Society requires that these experiments shall be under the immediate care and supervision of local committees, who endeavour to secure uniformity and accuracy in carrying out the details of each experiment, so that the results may be trustworthy. The Society provides all the manures required free of cost, and issues to each experimenter printed schedules minutely describing the nature of each experiment and the method of procedure. Reports of all the experiments are published in the Society's 'Transactions,' and copies of these are supplied by the Society, and distributed to the experimenters through the secretaries of the associations. Periodical visits are made by the chemist of the Society to the districts where the associations are at work, in order to meet the members and discuss with them the results of the experiments. Any expenses incidental to the carrying out and supervising of the experiments are also defrayed by the Society. The Government have during the last two years given a small grant to assist the Society in this work, and it is the opinion of the Committee that there are few ways in which money can be better spent in the interests of agriculture.

EXPERIMENT VIII.—THE CHEAPEST AND BEST  
TURNIP MANURE.

This experiment was tried in 1890 on upwards of fifty farms in various parts of the country, and the results were reported in last year's 'Transactions' (pp. 235-257). The associations who tried it determined to try it another year to see whether a different set of weather conditions might not considerably modify the very important lessons conveyed by it. Unfortunately the weather conditions of last year, though very different from those of 1890, were on the whole very unfavourable to the growth of the turnip crop; nevertheless useful information has been derived from the experiments, and we can rely

on the accuracy of the general facts elicited, thanks to the large number of corroborative experiments.

The general complaint of the associations in Aberdeenshire, where most of them are located, is that the seed, though well put in, was very late in brairding, owing to prolonged drought. The young plants came up very irregularly, so that some were only brairding while the rest were being singled. Shortly after singling, heavy floods occurred which greatly injured the young plants and killed many. In some cases they were in great measure carried bodily away and the experiment ruined, and in every case a serious number of blanks occurred in all the plots. To add to the misfortune of the floods came the visitation of the diamond-back moth, whose grubs riddled the leaves of the young plants, and in some cases almost exterminated the crop. The result of these troubles is, that there is not much more than half a crop of turnips in some of the districts, and in some there is much less. So far as the experiments are concerned the weather was about as unfavourable as it could be. Owing to the early drought the soluble nitrogenous manures did almost nothing to hasten the brairding, and the heavy rains which succeeded washed them down through the soil out of the reach of the young plants, so that on some of the lighter soils the results are the same as if no soluble nitrogenous manures had been applied at all.

The kinds, quantities, and cost of the manures of Experiment VIII. are—

Plot.	Quantities of Manure.	Per acre. cwt.	Cost per acre.			
			s.	d.	s.	d.
1.	Steamed bone-flour . . . .	2	12	0	} = 14	6
	Nitrate of soda . . . .	$\frac{1}{2}$	2	6		
2.	Superphosphate . . . .	$3\frac{1}{2}$	10	0	} = 14	6
	Nitrate of soda . . . .	$\frac{1}{2}$	4	6		
3.	Thomas-slag . . . .	5	10	0	} = 14	6
	Nitrate of soda . . . .	$\frac{1}{2}$	4	6		
4.	Mixed phosphates ( $2 + 3\frac{1}{2} + 5 \div 3$ )	$3\frac{1}{2}$	10	0	} = 14	6
	Nitrate of soda . . . .	$\frac{1}{2}$	4	6		
5.	Mixed phosphates . . . .	$3\frac{1}{2}$	10	0	} = 16	9
	Nitrate of soda . . . .	$\frac{1}{2}$	6	9		
6.	Mixed phosphates . . . .	$3\frac{1}{2}$	10	0	} = 19	0
	Nitrate of soda . . . .	1	9	0		
7.	Mixed phosphates . . . .	$3\frac{1}{2}$	10	0	= 10 0	
8.	Nothing . . . .	...	...	...	...	

These are small quantities of manure, and their cost is very moderate; but they are quite enough when applied in addition to farmyard manure, as is the custom in most places. If applied without dung, the quantities would require to be doubled to produce a full crop; but last season the quantities above given were used both with and without dung, mainly with

the view of testing the value of the dung when given along with fertilisers,—for that is quite as important a question as the value of fertilisers when given along with dung. One of the results shown by the experiment in 1890 was that fifteen to twenty loads of dung gave no more crop than 15s. worth of fertilisers, and the conclusion derived from that was that manuring turnips with dung did not pay; or rather, to put it more correctly, turnips was not a crop which could make a very profitable use of dung, and some better way of utilising dung should be found than the common one of throwing it away in great measure upon the turnip crop.

As regards the particular fertilisers used in Experiment VIII. it is enough to say that they are each the cheapest of its kind. The results of 1890 showed that, used in the quantities given above—viz., about equal money value—they were all about alike in their efficacy, but that a mixture of the three was rather better than any one singly. When with the mixture was given nitrate of soda in quantities of  $\frac{1}{2}$ ,  $\frac{3}{4}$ , and 1 cwt. per acre (plots 4, 5, and 6), the smaller quantities were found to be the most economical.

The results obtained in 1891 corroborate in the main those of 1890; but, on the whole, they are not so unfavourable to the use of dung.

#### VALE OF ALFORD ASSOCIATION.

##### *Experimenters.*

- Mr CHARLES M'INTOSH, Cairnballoch, Alford, *Secretary*.
- Mr GEORGE WILKEN, Waterside of Forbes.
- Mr WILLIAM WILSON, jun., Hillock, Terpersie, by Alford.
- Mr J. W. BENTON, Cattie, Whitehouse.
- Mr CHARLES M'COMBIE, Tillichetly, Alford.
- Mr GEORGE F. BARRON, Meikle Endovie, Alford.
- Mr SAMUEL MATTHEWS, Bandeen, by Whitehouse.
- Mr THOMAS WALKER, Westside of Bux, Kildrummy.
- Mr JAMES BARRY, Kildrummy Inn.
- Mr ALEXANDER GRASSICK, Knowhead, Towie.
- Mr JOHN REID, Nether Kildrummy.
- Mr J. G. FRASER, Muirton of Corse, Whitehouse.
- Mr WALKER, Mill of Fowls, Alford.
- Mr CRAN, Farmton, Inverkindie, Alford.

The result of the experiments in this district are given on Table I., p. 264. The farms are arranged as nearly as possible in the order of their strength, beginning with lighter soils and ending with the heavier ones.

We see at a glance that, despite the unfavourable nature of the season, the experiment has not been a failure. The manures have all told their story, and, upon the whole, with fair regularity. That the manures have had a very marked effect is

seen on comparing them with plot 8, which was left unmanured, and which yielded only half as heavy a crop. These plots are not quite so level as they were the former year, and the advantage lies with plots 2 and 4, to which soluble phosphates were applied. It would therefore seem that the drought at the beginning of the season was more detrimental to the success of the manures than the wet weather which followed. Plots 4 to 7, which show the effect of nitrogenous manure, are similar in their results to those of the former season, and convey the same lesson—viz., that the medium quantity of nitrate of soda is the most profitable, the proportion being about one part of nitrate of soda to five or six parts of phosphate. It is evident, however, that a good deal of the nitrate was lost during the wet weather.

A comparison of the plots which were dunged with those which were not shows that 15 to 18 yards of dung produced no better crop than 4 cwt. of fertilisers. The same fact was demonstrated by the experiments of the former year, and this confirmation of the results of the former year is all the more remarkable when the different character of the season is taken into account. One of the chief virtues of dung is that it is a bulky manure, which improves the texture of both light and heavy land, and mitigates the effects of both wet and dry weather. The weather of 1891 was eminently fitted to illustrate the superiority of dung over artificials, and we do find that dung showed to much greater advantage last year than it did the year before. The plot that got nothing but dung yielded 14 tons per acre, while the plot that got no manure of any kind produced only 7 tons 6 cwt. on an average, but the plots that got about 4 cwt. of artificials also yielded 14 tons turnips per acre; so that it is somewhat disappointing to find that, even under conditions most favourable for showing the superiority of farmyard manure over artificial, a quantity of farmyard manure which, at a moderate computation, cost about £4 per acre, produced no more crop than a mixture of fertilisers costing 14s. 6d. per acre. When both dung and artificials were applied the crop averaged 18 tons per acre, or 4 tons more than was got by the use of artificials alone, so that the increase due to the dung was got at the cost of 20s. per ton of turnips. Probably an additional 10s. per acre of artificials would have given as great an increase of crop, and there would thus have been a saving of £3, 10s. per acre. Notwithstanding the very poor appearance made by dung in comparison with artificials as a manure for turnips in these experiments, during a season when its advantages ought to have been most apparent, it will of course be said that there are other advantages derived from the dunging of the land. These were referred to in the former report, but the most patent fact is that the dung is made on the

farm, and it must be put on the land, and long custom has approved the application of it to the fallow crop. Customs which have the sanction of antiquity yield but slowly to innovations, however well supported by reason and new experience, and in agriculture perhaps more slowly than in other industries. It should be remembered, however, that the custom of applying all the dung of the farm to the fallow break has come down to us from remote times, long before the introduction of fertilisers; and nowadays, when these are so abundant and so cheap, and when their uses are becoming better known, it behoves us to reconsider the place which farmyard manure ought to take in the economy of the farm, and endeavour to discover how it may best be utilised. It seems to me that one of the most important lessons taught by these experiments is that the heavy application of dung to the turnip break, which is all but universally practised in the country, is not economical. A better way of utilising that valuable material ought to be found, and no more useful work could be undertaken by experienced experimenters than that of discovering the most advantageous methods of employing farmyard manure in the various rotations of cropping practised in different districts of the country.

#### TURRIF AGRICULTURAL ASSOCIATION.

##### *Experimenters.*

Mr DAVID DAVIDSON, Cabra, Mintlaw.  
 Mr ALEXANDER DURN, Floors, Auchterless.  
 Mr ADAM DAVIDSON, Boghead, Dunlugas.  
 Mr ALEXANDER KEITH, Kinermith.  
 Mr ALEXANDER JACK, Black Mill.  
 Mr J. KNOX LEDINGHAM, N. Plaidy.  
 Mr W. STRACHAN, Upper Muirden.  
 Mr WILLIAM NORRIE, Cairnhill, Monquhitter.  
 Mr JAMES COWIE, Hare Moss.  
 Mr WILLIAM THOMSON, Burnside of Idoch.  
 Mr A. CRUICKSHANK, Claymires, Turriff, *Secretary*.

The results in the Turriff district are shown on Table II., p. 266. They confirm in almost every particular the results of the Vale of Alford experiments. The results of Mr Norrie, Mr Cowie, and Mr Thomson are not included, for the reason that they were very much damaged by the larvæ of the diamond-back moth. At Hare Moss the crop on the undunged section did not average more than 2 tons per acre. At Cairnhill the average was under 3 tons, and at Burnside of Idoch it was about 5 tons. The section that got dung was considerably better. It was noticed that the grub was most severe upon the weakest plants, and that, where the crop was vigorous, the leaves, though much eaten, gave place to new growths, and in



the course of the season the injury was in great measure repaired.

On the lighter soils of this district the drought at the beginning of the season and the heavy rains which followed were more severely felt than in the Vale of Alford. The soils are by nature poor and greedy, and are very dependent on manuring for the production of crops. The unmanured plots had almost no crop at all. With the exception of Cabra, the unmanured crop would not average  $1\frac{1}{2}$  ton per acre. At Burnside the whole crop on the unmanured land, including both roots and tops, was little over half a ton, but the weak plants on the "nothing" plot were badly injured by the larvæ of the diamond-back moth.

#### INVERURIE AGRICULTURAL ASSOCIATION.

##### *Experimenters.*

Mr JAMES STEPHEN, Conglass, *Secretary*.

Mr GEORGE BRUCE, Heatherwick.

Mr JAMES DURN, Eastertown, Old Meldrum.

Mr WILLIAM PHILIP, Boynds, Keithhall.

Although the number of successful experiments in this district is small, they form a very reliable contribution to the results of the investigation (see Table III., p. 268). There was less injury done to them from weather than in most cases recorded, and they were carried out under otherwise favourable circumstances. They corroborate the experiments elsewhere, except in one particular—viz., that plot 4 with mixed phosphates is worse than any of the phosphates singly, both on the dunged and undunged section; but this may be, after all, accidental.

#### STRATHBOGIE FARMERS' CLUB.

##### *Experimenters.*

Mr JOHN DUNCAN, Downin.

Mr PETER HENDRY, Affleck.

Mr JAMES WILSON, Arnhall.

Mr JAMES MERSON, Craigwillie.

Mr ANDREW CRUICKSHANK, Huntly, *Secretary*.

Not the half of those who laid down the experiment in this district have been able to send in notes of their results. The injury done, especially from floods, was such as to entirely destroy the experiments. The experiments at Downin (see Table IV., p. 269) were carried out on a rich loam which prevented the crop from suffering from extremes of drought and flood. They show very little difference in the different phos-

phates and in the different quantities of nitrate used. The dunged section was carried out upon a different field from the other, so that no comparison can be made of the two sets of plots in this case. The plots at Affleck are not so even. It is evident that they have suffered a good deal. At Craigwillie the field was very wet, as it lay at the foot of a hill, and was therefore subject to much flooding.

#### KINCARDINESHIRE FARMERS' ASSOCIATION.

##### *Experimenters.*

Major WM. DISNEY INNES of Cowie, Stonehaven.  
 Mr JAMES DOUGLAS, Auquorthies, Stonehaven.  
 Mr JOHN PRATT, The Green, Raemoir, Banchory.  
 Mr WILLIAM DUNBAR, Newton, Raemoir, Banchory.  
 Mr JOHN BENNET, Myreside, Raemoir, Banchory.  
 Mr JOHN HART, Mains of Cowie, Stonehaven, *Secretary*.

In this as in other districts a great proportion of the experiments were destroyed in one way or another. Those which were considered reliable were reported, and the results are contained on Table V., p. 270. Most of the experimenters applied the manures on the dunged land, but the results are very similar to those on the undunged land. The general nature of the land is light and sandy, and, as a consequence, favourable, especially during wet seasons, to the action of insoluble manures. Hence we find that the steamed bone-meal in this district last year was rather better than the other forms of phosphate, and that the nitrate seemed to have been almost entirely washed out of the land and lost to the crop. In this district the floods did more damage than the early drought, and it would seem that the presence of the dung which was applied in the drills did nothing to prevent the loss of the other manures applied.

#### ROSS AND CROMARTY AGRICULTURAL EXPERIMENT CLUB.

##### *Experimenters.*

Mr GEORGE MIDDLETON, Comtown, Dingwall.  
 Mr WILLIAM WALKER, Contullich, Alness.  
 Mr WALTER ARRAS, Fodderty, Dingwall.  
 Mr JAMES SCOTT, Seafield, Fearn.  
 Mr JOHN ROSS, Meikle Tarrel, Fearn, *Secretary*.

The Ross and Cromarty Agricultural Experiment Club is a strong society, whose members have for many years been carrying on experiments with manures, and have experienced great benefit from the instruction obtained in that way. Last year they expressed their desire to take part in the Society's experi-

ments ; but as it was somewhat late in the season before arrangements could be made, only a few of the members were able to co-operate, and the half of these found their experiments so much injured as to be valueless.

The land of the district is in marked contrast to that of the Kincardineshire district, and, as a consequence, the results are different (see Table VI., p. 271). For these heavy soils a soluble phosphate is wanted, and there is comparatively little risk of nitrate or other soluble manures being washed away. There is one feature of these experiments that deserves special notice—viz., the very large crop on Fodderty, very large, considering the season. The field is on a good strong bit of land ; but Mr Arras is of opinion that the heaviness of the crop was not due to that chiefly, for in other places, with as good a soil, there was not so good a crop. He attributes it to the application of the farmyard manure in autumn instead of at the sowing-time, as is the usual custom. By this means not only was the land more capable of retaining its winter moisture during the dry spring, but it was not laid open to the drought in the process of opening and closing the drills at sowing-time. Mr Arras reports that the seed was long in brairding, for the first inch or two would doubtless be dry enough ; but as soon as the roots of the young plants got hold of the dung and the moisture it had retained, they grew apace, while the crops elsewhere were almost stationary for want of water.

The only other trial of Experiment VIII. to be recorded is one carried out by the Master of Polwarth at Humbie. It was the only experiment of the kind in East Lothian, and for the sake of convenience the results are inserted on Table VI., p. 271. The land was poor, and had been steam ploughed and steam cultivated and harrowed. The application of dung has not done more than to raise 3 tons of turnips. Slag seems to have done better than the other phosphates, and it may be that the lime of that manure has been beneficial. The crop was attacked by the diamond-back moth, and it was observed that the attack was most severe on parts where no artificials had been applied.

#### SUMMARY OF RESULTS OF EXPERIMENT VIII.

In 1890 there were sixty trials of this experiment reported, and last year, despite the unfavourable season, there were seventy successful trials reported. The general conclusions to be drawn from these trials are :

1. That steamed bone-flour, superphosphate, and very finely ground Thomas-slag, when applied in quantities of equal money

value per acre, may be of nearly equal efficiency as turnip manures. On light soils, the advantage lies with steamed bone-flour; on heavy soils the other two are more advantageous.

During wet seasons, steamed bone-flour and Thomas-slag are at their best; during dry seasons superphosphate is the best of all.

A mixture of these makes a very good phosphatic manure.

2. In most cases the addition of nitrate of soda to such a mixture has produced a profitable increase in the crop.

3. The amount of nitrate of soda which may be profitably added to such a mixture is not much more than  $\frac{1}{2}$  cwt. nitrate to  $3\frac{1}{2}$  cwt. phosphates.

4. When a manure consisting of  $3\frac{1}{2}$  cwt. phosphates and  $\frac{1}{2}$  cwt. nitrate of soda per acre was applied, at a cost of about 15s., it increased the turnip crop as much as about eighteen loads of farmyard manure.

5. When, in addition to this mixture, eighteen loads of farmyard manure were applied, it produced an increase of less than 4 tons of root per acre.

6. It may therefore be inferred that a turnip manure of double strength, consisting of 7 cwt. phosphates and 1 cwt. nitrate of soda, will produce a larger crop of turnips at a cost of 30s. per acre than can be produced by heavy dunging at four times the cost.

7. Nitrate of soda is employed most profitably on heavy land, and the slight benefit derived from its application to light land, especially during wet seasons, shows that it is not a suitable form of nitrogenous manure for that class of land.

8. The increased crop obtained on very light land by the use of steamed bone-flour, and the very slight increase due to the application of nitrate of soda in such circumstances, points to the conclusion that the nitrogenous matter of the steamed bone-flour is more suitable than nitrate of soda for that class of land, and that a still better result would be obtained by applying very finely ground bone-meal, which contains about thrice as much nitrogen.

9. The manures employed in this experiment contained no potash, but former experiments, and also the results of Experiment IX. last year (p. 279), have conclusively proved that, where no dung is applied, the addition of potash materially benefits the turnip crop, and it is therefore evident that for a full crop of turnips, some potash manure should be added to the above mixture.

10. Farmyard manure may with advantage be applied to strong land in autumn. The advantage will be especially great in dry winters or in the event of a drought in spring.

TABLE I.—EXPERIMENT VIII. VALE OF ALFORD ASSOCIATION.

*Manures applied alone.*

PLOT	MANURES PHOSPHATES, cwt. per acre NITRATE " "	1 Bone-flour 2 $\frac{1}{4}$	2 { Superphos- phates } $3\frac{1}{2}$ $\frac{1}{2}$	3 Slag 5 $\frac{1}{2}$	4 Mixed $3\frac{1}{2}$ $\frac{1}{2}$	5 Mixed $3\frac{1}{2}$ $\frac{3}{4}$	6 Mixed $3\frac{1}{2}$ 1	7 Mixed $3\frac{1}{2}$ None	8 None None None
		tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Cairnballoch	For acre—	8 13 $\frac{1}{4}$	11 1 $\frac{1}{2}$	8 15	11 1 $\frac{1}{2}$	10 11	11 8 $\frac{1}{2}$	9 13	4 16 $\frac{1}{2}$
Hillock, Terspersie	.	16 15 $\frac{1}{2}$	17 3	16 15 $\frac{1}{2}$	16 15 $\frac{1}{2}$	20 0	16 1 $\frac{1}{2}$	15 0	7 3
Cattie, Whitehouse	.	10 5	11 0	10 4	10 10	11 8	13 0	11 7	5 0
Waterside of Forbes	.	15 16	14 0	12 13 $\frac{1}{2}$	15 19 $\frac{1}{2}$	14 11	17 8	9 2	7 17
Meikle Endovie	.	13 18 $\frac{1}{2}$	15 13 $\frac{1}{2}$	15 16 $\frac{1}{2}$	14 19 $\frac{1}{2}$	16 1	17 15 $\frac{1}{2}$	15 14	6 5 $\frac{1}{2}$
Bandeen of Whitehouse	.	8 13	11 0	9 3 $\frac{3}{4}$	10 3 $\frac{1}{2}$	10 8 $\frac{3}{4}$	10 5 $\frac{1}{4}$	10 7	2 0
Westside of Bux	.	18 15	18 0	17 10	19 2	21 1	18 4	18 18	11 15
Knowhead, Towie	.	13 18	13 18	11 15	12 10	13 11	13 18	11 15	11 1
Nether Kildrumny	.	15 0	15 14	15 7	13 18	16 1	14 2	14 12	9 5
Average	.	13 10	14 3	13 2	13 18	14 16	14 13	12 18	7 6

*Manures applied along with Farmyard Manure.*

Cairnballoch . . .	11	19 $\frac{1}{4}$	14	11	12	15 $\frac{1}{2}$	12	15 $\frac{1}{2}$	13	18 $\frac{1}{2}$	12	10	12	9 $\frac{1}{4}$	4	15
Hillock, Terspersie . . .	17	3	16	1 $\frac{1}{2}$	21	16	21	1 $\frac{1}{2}$	17	10	20	0	18	18 $\frac{1}{2}$	15	0
Cattie, Whitehouse . . .	14	5	15	11	14	0	14	6	15	13	17	0	13	15	14	7
Waterside of Forbes . . .	18	11 $\frac{1}{2}$	17	6 $\frac{1}{2}$	16	12	19	14 $\frac{1}{2}$	18	6	19	11	18	9 $\frac{1}{2}$	18	4
Meikle Endovie . . .	12	12	18	7 $\frac{1}{2}$	16	7 $\frac{1}{2}$	16	18 $\frac{1}{2}$	14	15	17	12 $\frac{1}{2}$	13	12 $\frac{1}{2}$	10	0
Bandeen of Whitehouse . . .	14	5 $\frac{1}{2}$	16	12	16	15 $\frac{1}{2}$	17	10	18	0	17	6	19	9	14	5 $\frac{1}{2}$
Westside of Bux . . .	21	15	20	17	24	12	24	5	24	5	21	12	22	10	19	5
Knowhead, Towie . . .	18	15	21	1	19	12	21	8	21	1	20	14	21	8	13	11
Nether Kildrumny . . .	20	0	19	12	18	4	21	12	17	6	16	1	17	4	16	8
Average . . .	16	11	17	13	18	0	19	0	18	0	18	0	17	11	14	0
Tillychety . . .	18	2 $\frac{1}{2}$	22	1	21	10 $\frac{1}{2}$	22	11 $\frac{1}{2}$	20	12 $\frac{1}{2}$	21	10 $\frac{1}{2}$	21	5	...	
Kildrumny Inn . . .	19	9	15	14	14	9	17	17	20	14	15	0	18	18	11	12

*Notes.*—CAIRNBALLOCH—Light shingly soil. Dung, 15 yards.

HILLOCK—Gravelly soil; clay subsoil. 900 feet above sea. Dunged plots in advance of others. Dung, 16 yards.

CATTIE—Light friable loam. No. 8 undunged. Injured by wood-pigeons. Dung, 15 loads.

WATERSIDE—Light loam; poor gravelly subsoil. Dung, 15 loads.

MEIKLE ENDOVIE—Medium loam. Dung, 16 loads.

BANDEEN—Black loam; porous subsoil. Dung, 14 yards.

WESTSIDE OF BUX—Black loam; porous subsoil. Dung, 16 loads.

KNOWHEAD—Haughland; gravelly subsoil. Dung, 17 yards.

NETHER KILDRUMNY—Haughland; sandy subsoil. Dung, 15 loads.

TILLYCHETY—Sandy loam. Dunged in autumn. Dung, 16 yards in autumn.

KILDRUMNY INN—Sandy clay. Dung, 18 yards.

TABLE II.—EXPERIMENT VIII. TURRIFF AGRICULTURAL ASSOCIATION.

*Manures applied alone.*

Plot	1	2	3	4	5	6	7	8
MANURES	Bone-flour	{ Superphos- phates } 3½	Slag 5	Mixed 3½	Mixed 3½	Mixed 3½	Mixed 3½	None
PHOSPHATES, cwt. per acre	2	3½	5	3½	3½	3½	3½	None
NITRATE	4	½	½	½	¾	1	None	None
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Cabra, Mintlaw	19 4	20 13½	19 6	19 18	21 7	19 16	18 12	11 6
Floors, Auchterless	10 12½	9 9	10 19½	10 18	11 14	10 16	7 1	1 10
Boghead, Dunlugas	12 3	13 11½	11 6	11 6	12 3	12 11½	9 14½	1 11½
Kinnernit	11 2	9 12	9 12	9 0	10 18	11 7	9 1	1 5
Black Mill	6 0	6 5	6 12½	6 2½	7 0	6 15	5 10	1 12½
North Plaidy	9 15	11 17	10 1½	10 3	12 11½	9 11½	9 6	...
Average	11 10	11 18	11 7	11 5	12 12	11 17	9 17	

*Manures applied along with Dung.*

Cabra, Mintlaw . . . . .	23	17	23	11	25	13	25	2	24	13	26	11	24	8½	20	7
Floors, Auchterless . . . . .	11	3½	11	7	12	4½	11	6	12	12	16	0	7	6½	8	4½
Boghead, Dunlugas . . . . .	15	17	14	14	14	14	15	14	13	16½	15	13	13	17	10	15½
Kinnermit . . . . .	13	2	12	5	12	8	13	4	10	14	14	18	13	7	8	15
Black Mill . . . . .	9	16	10	10	10	10	9	0	11	15	12	7½	8	2½	8	0
North Plaidy . . . . .	11	8½	13	1½	12	6½	13	13½	13	9½	16	0	12	12	12	1½
Average . . . . .	14	4	14	5	14	13	14	13	14	10	16	18	13	3	11	7
Upper Muirden, No. 1 . . . . .	17	0	16	13	19	16½	20	1½	19	1½	20	4½	17	9	14	2
" " No. 2 . . . . .	13	5	15	12½	15	17	15	14	17	5	15	16½	13	11½	12	14

*Notes.*—CABRA—Sandy loam, Dung, 15 yards.

FLOORS—Light soil; brown absorptive subsoil. Dung, 12 yards.

BOGHEAD—Friable loam; sandy clay subsoil. Dung, 12 yards.

KINNERMIT—Clay slate. Dung, 16 loads.

BLACK MILL—Black loam; stiff clay subsoil. Dung, 14 yards.

NORTH PLAIDY—Heavy loam; clay-slate subsoil. Dung, 16 yards.

UPPER MURDEN, No. 1—Light loam; gravelly subsoil. Dung, 20 yards.

" " No. 2—Hard loam; sandy clay subsoil; poor condition. Dung, 16 yards.



TABLE III.—EXPERIMENT VIII. INVERURIE AGRICULTURAL ASSOCIATION.  
Manures applied alone.

Plot	1	2	3	4	5	6	7	8
	Bone-flour	{Superphos- phates}	Slag	Mixed	Mixed	Mixed	Mixed	None
MANURES	2 ½	3 ½	5	3 ½	3 ½	3 ½	3 ½	0
PHOSPHATES, cwt. per acre	1	½	½	½	¾	1	0	0
NITRATE	1	1	1	1	1	1	1	1
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Heatherwick	9 2 ½	9 12	8 8	8 12	9 11 ½	9 6 ½	7 0	3 11
Eastertown, Old Meldrum	11 17	13 2	12 19	10 18	14 11	15 5	9 2	2 1
Boydys, Keithhall	20 10	19 3 ½	18 10	17 4	21 14	20 18 ½	18 18	16 6
Conglass	15 4	16 15	16 7	14 17	18 0	18 10	16 17	16 14
Average	14 3	14 13	14 1	12 18	15 19	16 0	12 19	9 13
<i>Manures applied along with Dung.</i>								
Heatherwick	11 11	10 13	10 6	10 2	13 6	12 15	10 0	3 11
Eastertown	14 1	16 16	14 15	13 18	15 14	15 6	12 13	11 5
Boydys	22 9	22 5	22 12	21 18	21 18	20 12	21 0	18 16
Conglass	18 17	17 13	17 14	13 19	20 6	19 8	18 2	16 15
Average	16 15	16 17	16 7	14 19	17 16	17 0	15 9	12 12

Notes.—HEATHERWICK—Light friable soil ; granite subsoil. Dung, 15 loads.  
EASTERTOWN—Light hill soil ; 760 above sea-level. Dung, 18 yards.  
BOYDYS—Light loam ; gravelly subsoil. Dung, 16 yards.  
CONGLASS—Loam on rocky bottom. Dung, 15 yards.

TABLE IV.—EXPERIMENT VIII. STRATHBOGIE FARMERS' CLUB.

*Manures applied alone.*

Plot	1	2	3	4	5	6	7	8
MANURES	Bone-flour	{ Superphos- plates } 3½	Slag	Mixed	Mixed	Mixed	Mixed	None
PHOSPHATES, cwt. per acre	2	3½	5	3½	3½	3½	3½	None
NITRATE	¼	½	½	½	¾	1	None	None
Per acre—	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Downin .	15 4	14 10	15 7	14 19	15 9	15 14	15 5	4 10
Affleck .	14 13	13 15	11 10	11 12	12 8	11 5	7 12	8 15
Arnhall .	14 0	13 12	12 2	14 2	15 7	12 2	13 14	2 7
Average	14 12	13 16	13 0	13 11	14 8	13 0	12 4	5 4

*Manures applied along with Dung.*

Downin .	20 4	20 4	19 13	20 17	20 4	20 11	19 4	19 10
Affleck .	12 19	19 18	16 5	18 2	17 15	22 11	16 6	13 6
Arnhall .	16 14	17 10	18 2	18 1	19 0	19 4	15 5	8 11
Average	16 12	19 4	18 0	19 0	19 0	20 15	16 18	13 16
Craigwillie	8 11	9 1	8 6½	8 10	6 0	9 14	8 17	3 16

TABLE V.—EXPERIMENT VIII. KINCARDINESHIRE FARMERS' ASSOCIATION.

*Manures applied without Dung.*

Plot	1 { Steamed } { four-flour }	2 { Superphos } { plates }	3 Slag	4 Mixed	5 Mixed	6 Mixed	7 Mixed	8 None
MANURES	.	.	.	.	.	.	.	.
PHOSPHATES, cwt. per acre	2	3½	5	3½	3½	3½	3½	0
NITRATE " "	4	½	½	½	¾	1	0	0
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Lungair, Stonehaven	8 3	8 4	7 8½	7 10	6 11	7 4	7 10	2 3½
Auquorthies "	10 14	8 3	7 5½	9 17	9 0	6 8½	7 3	3 5½

*Manures applied along with Dung.*

Lungair.	9 7	10 4	8 18½	10 15½	8 5½	10 4	8 18½	8 8½
The Green, Raemoir, Banchory	11 4	10 14	10 14	11 3	11 11	10 10	10 10	7 3
Mains of Raemoir, "	24 0	25 11	25 11	25 2	23 5½	22 17	24 5½	18 13
Newton Raemoir, "	23 0	23 3½	20 17	22 0	22 18	21 9	19 6	15 3
Myreside, " "	19 8½	16 11	15 0	17 10	16 13	16 0	13 7	12 10
Mains of Cowie, Stonehaven	13 10	11 8½	14 10	15 0	12 18½	9 8	14 6	13 16
Average	16 18	16 5	15 18	16 18	15 18	15 1	15 2	12 12

*Notes.*—LUNGAIR—Strong loam, on clay. 20 loads dung.

AUQUORTHIES—Moorland.

THE GREEN—Light black soil; sandy subsoil. 20 loads dung.

Mains of Cowie—Light black loam, on gravel. 12 loads dung.

Mains of Raemoir—Light black soil; sandy subsoil. 20 loads dung.

Newton—Light sandy soil; gravelly subsoil. 15 loads dung.

Myreside—Light loam. 16 loads dung.

TABLE VI.—EXPERIMENT VIII. ROSS AND CROMARTY AGRICULTURAL EXPERIMENT CLUB, ETC.

*Manures applied without Dung.*

Plot	1	2	3	4	5	6	7	8
MANURES	{ Steamed } { Bone-flour }	{ Superphos- } { Phates }	Slag	Mixed	Mixed	Mixed	Mixed	None
PHOSPHATES, cwt. per acre	2	3½	5	3½	3½	3½	3½	0
NITRATE " "	½	½	½	½	¾	1	0	0
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Corn town	8 14	12 11	11 12	13 17	12 4	14 10	9 18	5 10
Meikle Tarrel	17 13	20 19	18 2	18 0	18 6	20 9	16 15	7 15
Contullich, Alness	14 13	16 4	12 8½	12 17	14 14	16 5½	13 0	8 3
Humbie	6 1	8 0	9 1	8 17	9 11	10 12	10 16	4 8

Corn town	12 17	14 1	15 0	16 1	16 2	15 18	14 6	11 4
Meikle Tarrel	18 14	19 2	20 13	19 17	21 0	20 10	20 0	12 17
Fodderty	33 5	34 5	33 14	32 0	31 18	31 14	28 14	25 2
Seafeld	18 0	19 0	17 3	17 10	21 13	18 2	20 0	14 15
Humbie	8 10	11 9½	11 19	10 14½	11 16	10 6	9 4	7 7

*Manures applied along with Dung.*

*Notes.*—CORTOWN.—Gravelly sand. 15 loads dung in drills.  
 MEIKLE TARREL.—Black loam; clay subsoil. 20 loads dung in drills.  
 FODDERTY.—Strong loam. 20 loads dung in autumn.  
 SEAFELD.—Loam, on clay. 19 loads dung in drills.  
 CONTULLICH.—Light sandy loam. Plot 2 had some finger and toe.  
 HUMBLE, EAST LOTHIAN.—Poor stiffish clay.

## EXPERIMENT VI.

## BERWICKSHIRE AGRICULTURAL ASSOCIATION.

*Experimenters.*Mr ADAM LOGAN, Ferney Castle, Reston, *Secretary*.

Mr J. P. F. BELL, Greenwood.

Mr H. H. CRAW, Foulden, West Mains, Berwick.

Mr J. H. LAURIE, Langton, Duns.

Mr WM. FAIRBAIRN, Manderston.

Mr H. MIDDLETON, Kimmerghame Mains, Duns.

The object of this experiment is threefold. First, to test the relative efficacy of superphosphate and Thomas-slag, when applied in quantities of the same money value. Second, to test the efficacy of sulphate of ammonia and of nitrate of soda, when applied in three different proportions—small, medium, and large. Third, to see whether the application of the nitrogenous manure in March or April would be as useful as applying it at the time of sowing the turnip-seed.

The quantities of manures applied, and the cost per acre, were as follows, and no dung was used in these experiments—

Plot.	Superphosphate. cwt.	Sulphate of Ammonia. lb.	Cost.
1	6	40	18s.
2	6	80	22s.
3	6	120	26s.
	Thomas-slag. cwt.	Nitrate of Soda. lb.	
4	7	50	15s.
5	7	100	19s.
6	7	150	23s.

This experiment was tried also by the Border Union Association, and reported in the former volume of the 'Transactions,' p. 258. The results of the Berwickshire Agricultural Association here described were sent in too late for publication. The weighings are given on Table I., p. 273, from which it will be seen that the two mixtures—viz., superphosphate and sulphate of ammonia on the one hand, and Thomas-slag and nitrate of soda on the other—applied in the quantities described above, have produced on the average exactly the same amount of crop—viz., 20½ tons per acre. The relative cost of the two mixtures was slightly in favour of the latter at the time, but during the present season they are as nearly as possible equal. The experiments of the Border Union Association showed that the Thomas-slag and nitrate of soda were better than the other; but the superiority was very slight, and the net results of all the

TABLE —EXPER ENT BERW RE AGRICULTU ASSOCIATION. 890.

No. OF PLOT SULPHATE OF AMMONIA. NITRATE OF SODA	Per acre— Nitrogen applied.	Superphosphate (27%) 6 cwt.			Thomas-slag (38%) 7 cwt.		
		1 40 lb. ...	2 80 lb. ...	3 120 lb. ...	4 50 lb. ...	5 100 lb. ...	6 150 lb. ...
Greenwood	April 5	21 5	28 16	28 1	29 6	22 16	25 10
Do.	May 30	23 0	21 5	25 10	24 10	24 0	25 5
Foulden West Mains	June 6	25 0	24 10	20 0	22 0	25 0	21 0
Langton	March 18	21 5	23 11	23 2	22 3	21 0	22 10
Do.	May 31	21 2	23 1	22 5	23 5	22 12	22 1
Ferney Castle, No. 1	May 22	18 7	17 2	19 0	16 8	17 2	19 4
Do. No. 2	May 22	18 13	18 15	18 11	17 19	18 15	20 7
Manderston	March	14 8	16 10	17 3	14 0	16 0	17 12
Do.	June 16	15 0	16 14	17 1	13 11	15 12	16 16
Kimmerghame Mains	March	18 19	22 14	20 10	20 1	22 5	23 15
Do.	May 16	21 7	18 3	17 14	18 3	16 12	19 17
Average	...	19 17	21 0	20 16	20 2	20 3	21 6
Early spread series	...	18 19	22 18	22 4	21 8	20 5	22 4
Late do.	...	20 2	19 16	20 12	19 12	19 14	21 0

experiments is that they are practically alike in efficacy. It must be noted, however, that the Thomas-slag used in these experiments was of very fine quality; it was not only rich in phosphate, but it was very finely ground. The fineness to which this manure is ground is of the greatest importance in determining its value as a manure. The qualities at present in the market differ considerably in richness—viz., from 30 to 40 per cent of phosphate; but even that great difference in the quality matters little in comparison with the fineness to which the material is ground. The machinery now employed for grinding Thomas-slag is capable of producing a powder so fine that the whole of it can pass through a sieve of 10,000 holes per square inch; and as its efficacy is in the first place dependent on its fineness, no sample of the material should be used of which 80 per cent at least does not pass through a sieve of that description, and buyers of Thomas-slag should insist upon the standard of fineness in the first instance. The amount of phosphate is of little importance so long as it can be bought at one shilling and a penny per unit of phosphate of lime.

The second part of the inquiry—viz., to determine what is the most economical amount of nitrogenous manure of a soluble kind to employ along with these phosphates—receives a very explicit answer. It is evident that three quarters of a cwt. of sulphate of ammonia along with six cwt. of superphosphates, and about one cwt. of nitrate of soda along with seven cwt. of Thomas-slag, is quite enough to obtain a full crop on land in good condition—that is to say, on land that is not poor in nitrogenous matter. In this respect the experiments of the Berwickshire Association confirm the results of the Border Union Association. As to the time at which the sulphate of ammonia and nitrate of soda may be spread, these experiments show that their application a few weeks before the seed is sown is, on the whole, advantageous, but especially so in the case of sulphate of ammonia, so that if there is any increased convenience in applying these manures some time before sowing the turnip-seed, it may be done quite safely and even profitably. There is a general belief that these soluble nitrogenous manures cannot be profitably applied sooner than the time of sowing, but these experiments lend no support to that opinion. Had the early season been very wet, there would have been some loss, especially of nitrate of soda; but, on the other hand, in the case of drought during the month of June, such as we had last year, it is quite evident that the early application of these manures would have been of enormous advantage. An early braird is more important than anything else for the production of a good turnip crop; and as we cannot in this country forecast the weather, it seems to me that a very safe practice would be to

apply some sulphate of ammonia to the turnip break a month before time of sowing, and to apply the rest of the nitrogenous manure in form of nitrate of soda at a later date, say a week or so after singling. I am convinced that, if that had been done last year, the turnip crop over the country would have been increased by at least one-fourth, and in many places by a good deal more.

#### EXPERIMENT IX.

*To test the relative merits of nitrate of soda and of sulphate of ammonia as a soluble nitrogenous manure for the turnip crop, and to discover the most advantageous way of applying them.*

The manurial experiment of 1889 and 1890 had shown that Thomas-slag and superphosphate were the most advantageous phosphatic manure to apply to the turnip crop, and that the nitrogenous part of a turnip manure should bear to the phosphatic part a ratio which might be expressed as 1 of ammonia to 14 of phosphoric acid.

It had also been found that soluble nitrogenous manures, such as nitrate of soda and sulphate of ammonia were, on the whole, more reliable than less soluble substances, but whether the one or the other of these was better, had not been tried by the associations. Experiment IX. was designed for this purpose; and as the efficiency of a soluble nitrogenous manure depends not only on the nature of the manure itself, but also on the method of its application, it was resolved to include that within the scope of the inquiry.

A turnip manure was made up consisting, so far as phosphates are concerned, of 5 cwt. Thomas-slag and 2 cwt. superphosphate. That was the quantity required for an acre, and it was common to all the plots. The nitrate of soda and sulphate of ammonia were not mixed with it but supplied separately. The nitrate was applied at the rate of 120 lb. per acre, and the sulphate of ammonia at the rate of 86 lb. per acre, which is the quantity of sulphate equivalent in nitrogen to 120 lb. nitrate of soda. They were both applied in four different ways, viz:—

Plot 1. In one dose at the time of sowing.

Plot 2. In two doses: one-half at sowing and the other half a week or so after singling.

Plot 3. In three doses: one-third at sowing, one-third shortly after singling, and one-third about six weeks thereafter.

Plot 4. Also in three doses: none with the seed, but one-



third shortly after singling, one-third six weeks thereafter, and the remaining third after other six weeks.

Plot 5 got nothing but the phosphate.

Plot 6 got nothing at all.

As the application of dung would have obscured the results of such an experiment, no matter how evenly it might have been spread, it was tried on land not otherwise manured.

It was suggested to me by Mr Milne that many districts in Aberdeen, where the experiment was to be tried, had soils poor in potash, and that as no dung was to be used, it would add to the value of the experiment if potash was added to one of the plots. Inasmuch as plot 5 of both series A and B were exactly alike, it was resolved to add to plot 5, B, sulphate of potash at the rate of about 1 cwt. per acre, and as will be seen by the results contained on pp. 281, 283, 286, the addition of potash has had a marked effect in increasing the crop.

#### TURRIFF AGRICULTURAL ASSOCIATION.

##### *Experimenters.*

Mr ALEX. M. LEDINGHAM, Fintry, Turriff.

Mr ADAM DAVIDSON, Boghead, Dunlugas.

Mr ALEX. DURNO, Floors, Auchterless.

Mr W. STRACHAN, Upper Muirden.

Mr ALEX. KEITH, Kinnermit.

Mr ALEX. JACK, Blackmill.

Mr DAVID DAVIDSON, Cabra, Mintlaw.

Mr WILLIAM NORRIE, Cairnhill, Monquhitter.

Mr JAMES COWIE, Haremoos, by Turriff.

Mr WILLIAM THOMSON, Burnside of Idoch, Turriff.

Mr A. CRUICKSHANK, Claymires, *Secretary*.

The results obtained in this district are given on Table I., p. 280. The general character of the soil is light and sharp, with a stiffish clay subsoil. The soils on the whole are shallow, of a poor kind, unusually dependent on the application of manure for their fertility.

The circumstances in which this experiment was made were as unfavourable as they well could be—a very dry June which retarded brairding, and deluges of rain in July and August, and thereafter, which washed the nitrate of soda and sulphate of ammonia out of the land. The retentive clay subsoil caused the crops to be much under water, and the greatest difficulty was the getting the water away. There had been no season so disastrous to the turnip crop for nineteen years.

The result is that there is very little to be learned from Experiment IX. On the whole, the earlier application of the nitrate of soda and sulphate of ammonia was most beneficial, and the sulphate of ammonia was not washed away to the same

extent as the nitrate of soda, and proved, as might have been expected, more suitable than the nitrate of soda for application in a wet season. The plots that got no manure at all bore almost no crop, showing how needy and greedy the soils of the district are. The phosphatic manures (slag and super, at the rate of 7 cwt. per acre) were sufficient to produce a good crop without dung; and had the soluble nitrogenous manures not been washed away, they would doubtless have produced a larger crop than could have been given by the ordinary application of farmyard manure; but as it was they did not, for everything was in favour of farmyard manure, both in respect of its physical and chemical character. But one very useful lesson taught by the experiment as carried out in Aberdeenshire is the need of potash as a constituent of a turnip manure over a number of soils in that district. Plot 5 of the B series, which received phosphates and potash sulphate, without any nitrogenous manure, is on some of the farms the best of all the plots.

At Cairnhill, Hare Moss, and Burnside of Idoch, the crops were so much damaged, especially by the attacks of the diamond-back moth, that the results are withheld, although the experiments were most carefully carried out.

#### VALE OF ALFORD ASSOCIATION.

##### *Experimenters.*

Mr CHARLES M'INTOSH, Cairnballoch, Alford, *Secretary*.  
 Mr JOSEPH BROWN, Little Endovie, Alford.  
 Mr WILLIAM WILSON, jun., Hillock Terpersie, by Alford.  
 Mr JAMES CRAN, Knockandoch, Whitehouse.  
 Mr J. W. BURTON, Cattie, Whitehouse.  
 Mr GEORGE WILKEN, Waterside of Forbes, Alford.  
 Mr SAMUEL MATTHEWS, Bandeen, by Whitehouse.  
 Mr WILLIAM YOOL, Glenloggie, Forbes.  
 Mr GEORGE BARRON, Meikle Endovie, Alford.

In this district, as in the Turriff district, early drought and later floods did much mischief. The soluble nitrogenous manures were evidently washed away, and did almost nothing for the crop. The results are given on Table II., p. 282. They show that the phosphates have, almost unaided, produced a better crop than farmyard manure alone, and more than double the crop taken off the plot that received no manure. The addition of sulphate of potash has, in most cases, increased the crop; and though, strange to say, the nitrate of soda has on the whole been more advantageous than the sulphate of ammonia, it is reported by some that the turnips grown by the use of the latter were more shapely than the others, and less liable to form custocks.

## INVERURIE AGRICULTURAL ASSOCIATION.

*Experimenters.*

Mr JAMES STEPHEN, Conglass, Inverurie, *Secretary*.  
 Mr GEORGE BRUCE, Heatherwick.  
 Mr JAMES DURNO, Eastertown, Old Meldrum.  
 Mr JAMES WILSON, Arnhall, Huntly.

The results of these experiments are given on Table III., p. 286, and though few in number, they exhibit in a marked manner the peculiarities found in other districts—viz., the almost entire failure of the nitrate of soda manures to increase the crops, the more beneficial effect of sulphate of ammonia, and the very marked advantage derived from the addition of sulphate of potash to the turnip manure. Finger-and-toe appeared on Eastertown and Conglass, and at both places it was confined to the plots which got sulphate of ammonia.

## LAUDERDALE AGRICULTURAL SOCIETY.

*Experimenters.*

Mr ROBERT SHIRRA GIBB, Boon, Lauder.  
 Mr GEORGE RUNCIMAN, Wantonwalls, Lauder.  
 Mr JAMES JOHNSTON, Huntington, Lauder.  
 Mr JAMES M'DOUGAL, Lylestone, Lauder.  
 Mr ROBERT DICKINSON, Newbigging, Lauder.  
 Mr JOHN MACKAY, Newmills, Lauder.  
 Mr G. L. BROOMFIELD, Lauder, *Secretary*.

The experiments of this association (see Table IV., p. 284) were carried out under more favourable conditions as to weather than those in the north of Scotland. A slight increase in the crop, due to the nitrogenous manures, is noticed in some instances. As in other cases, where any increase due to nitrogen was observed, the earlier application was most beneficial; but there is no apparent difference in the relative efficacy of nitrate of soda and sulphate of ammonia, either in the quantity or quality of the crops produced. In this instance, no sulphate of potash was applied to plot 5 of the series B, so that the average of the two plots, No. 5, may be taken as representing the crop produced in the absence of nitrogenous manures. Owing to an accident which occurred to these plots at Boon, they were withdrawn from the experiment.

Besides the experiments reported above, a considerable number have been received whose results, owing to weather conditions and accidents of various kinds, cannot be regarded as reliable, despite the care which the experimenters took of them; and I must ask those whose careful labour has been lost, and who have themselves, in most cases, called attention to the un-

reliable character of their experiments, not to be discouraged in the good work they have been engaged in, but be ready to resume it in the coming season with hope of better success.

#### SUMMARY OF RESULTS OF EXPERIMENT IX.

1. The application of nitrate of soda and sulphate of ammonia, which was of most use during last season, was that in which the whole quantity applied was put in at the time of sowing. The prolonged drought, during June and part of July, prevented these manures from exercising their proper influence on the crop, and the prevalence of cold weather still further retarded their action; but when rain came, the plots that had received nitrogenous manure early started ahead of the others in most cases.

2. During the very wet weather which followed, the young plants derived some benefit from these manures; but the quantities applied later seem to have been washed away by the floods so rapidly as to prevent their being utilised by the crop.

3. The very late applications were altogether too late to be of any use, for by the time these manures were applied the turnips had set and ceased to grow.

4. In many instances the effect of sulphate of potash, applied to plot 5 of series B, was most beneficial, showing that the soils were probably in want of potash, and conveying the lesson that, in general, where no dung is used but only artificials in the manuring of turnips, some potash salts should be applied to the turnip break at a proper time, or that potash should form one of the ingredients of a turnip manure.

5. Where the nitrogenous manures produced any notable effect, it was observed that the sulphate of ammonia in most cases had the advantage, and that it was more suitable than nitrate of soda for application during a wet season; but, on the other hand, where finger-and-toe appeared, it was chiefly noticed on the plots where sulphate of ammonia was applied late in the season.

TABLE I.—EXPERIMENT IX. TURRIFF AGRICULTURAL ASSOCIATION.

A.—Nitrate of Soda, 120 lb. per acre.

	1	2	3	4	5	6
	Applied all at sowing.	Applied $\frac{1}{2}$ at sowing. $\frac{1}{2}$ after singling.	Applied $\frac{1}{2}$ at sowing. $\frac{1}{2}$ after singling. $\frac{1}{2}$ 6 weeks later.	Applied $\frac{1}{2}$ after singling. $\frac{1}{2}$ 6 weeks later. $\frac{1}{2}$ 12 weeks later.	No nitrogenous manure.	Unmanured.
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Fintry . . .	11 13	11 7	11 8	9 13	11 5	...
Boghead, Dunlugas .	12 11 $\frac{1}{2}$	12 8 $\frac{1}{2}$	12 3	12 8 $\frac{1}{2}$	11 11 $\frac{1}{2}$	1 11 $\frac{1}{2}$
Floors, Auchterless .	11 17 $\frac{1}{2}$	11 12	11 1	10 18	8 0	2 13 $\frac{1}{2}$
Upper Muirden .	12 5	15 0	15 0	13 11 $\frac{1}{2}$	10 15	0 17
Kinnernit . . .	11 19	10 7	8 14	8 11	8 1	2 15
Black Mill . . .	8 5	8 0	7 10	7 17 $\frac{1}{2}$	7 2 $\frac{1}{2}$	1 17 $\frac{1}{2}$
Cabra . . .	12 6	12 14	10 2 $\frac{1}{2}$	12 19	11 18	1 9
Average . . .	11 11	11 13	10 17	10 17	9 16	1 17

B.—*Sulphate of Ammonia*, 86 lb. per acre.

	11	4	11	17	12	12	10	10	Sulphate of potash.		...
									13	14	
Fintry . . .	11	4	11	17	12	12	10	10	13	14	...
Boghead, Dunlugas .	14	3	15	9	14	4	13	17	15	6	1 11½
Floors, Auchterless .	11	1½	10	10½	11	12	10	7	10	0	2 11½
Upper Muirden .	11	13½	15	10	14	5	13	7	11	0	0 17
Kinnermit .	11	1	10	8	9	13	8	12	11	2	3 17
Black Mill .	8	10	8	2½	8	0	7	10	7	0	2 0
Cabra . . .	13	18	14	2	13	7½	15	5½	22	3½	2 5
Average . . .	11	13	12	6	11	19	11	7	12	18	2 3

*Notes.*—FINTRY—Gravelly loam soil.

BOGHEAD—Friable soil, of fair quality; subsoil, sandy clay.

FLOORS—Light soil, with brownish eating subsoil.

UPPER MUIRDEN—Loam; hard sandy clay subsoil.

KINNERMIT—Clay-slate soil.

BLACK MILL—Black loam; stiff lay subsoil.

CABRA—Stiff loam.

TABLE II.—EXPERIMENT IX. VALUE OF ALFORD ASSOCIATION.  
A.—Nitrate of Soda, 120 lb. per acre.

	1 Applied all at sowing.	2 Applied $\frac{1}{2}$ at sowing. $\frac{1}{2}$ after singling.	3 Applied $\frac{1}{2}$ at sowing. $\frac{1}{2}$ after singling. $\frac{1}{2}$ 6 weeks later.	4 Applied $\frac{1}{2}$ after singling. $\frac{1}{2}$ 6 weeks later. $\frac{1}{2}$ 12 weeks later.	5 No nitrogenous manure.	6 Unmanured.
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Little Endovie . . .	17 10 $\frac{1}{2}$	15 8 $\frac{1}{2}$	14 17	16 0	14 5 $\frac{1}{2}$	...
Hillock Terseric . . .	22 3	24 6	23 11 $\frac{1}{2}$	17 3	18 4	7 3
Cairnballoch . . .	11 5	10 16	11 10 $\frac{1}{2}$	10 14	7 15 $\frac{1}{2}$	...
Knockandoch . . .	14 8	15 0	15 5	15 0	13 12	9 12
Cattie . . .	13 16	14 10	12 10	12 14	14 15	...
Waterside of Forbes . . .	15 8	14 0	15 8	16 11	11 17	...
Bandeen . . .	11 5	11 17 $\frac{1}{2}$	12 12	10 16	10 7	...
Glenloggie . . .	20 18 $\frac{1}{2}$	20 0	20 14	21 13	23 18 $\frac{1}{2}$	8 8
Meikle Endovie . . .	19 8 $\frac{1}{2}$	19 14	19 1 $\frac{1}{2}$	17 1	16 4 $\frac{1}{2}$	...
Average . . .	16 6	16 4	16 3	15 6	14 11	...

B.—*Sulphate of Ammonia*, 86 lb. per acre.

	16	11½	18	5½	16	0	14	5½	Sulphate of potash. 13 14	...
Little Endovie .	22	3	19	13	21	16	15	0	15	0
Hillock Terspersie .	11	14	10	3½	9	18	9	7½	8	1
Cairnballoch .	11	13	12	7	12	18	15	0	15	3
Knockandoch .	14	15	15	15	14	12	14	3	15	8
Cattie .	13	14	11	17	11	5½	14	5½	14	11
Waterside of Forbes .	13	4	17	3	11	8½	10	14	14	2
Bandeem .	22	14	19	5½	21	1½	20	0	23	18½
Glenloggie .	17	6½	16	13½	19	16½	17	8½	21	5½
Meikle Endovie .	15	19	15	14	15	8	14	13	15	11
Average .										

Notes.—LITTLE ENDOVIE—Light soil.

HILLOCK TERSPERSIE—Gravelly soil and subsoil. 900 ft. above sea-level.

CAIRNBALLOCH—Shallow soil, with gravelly subsoil.

KNOCKANDOCH—Heavy loam.

CATTIE—Light friable loam.

WATERSIDE OF FORBES—Light loam; poor subsoil.

BANDEEM—Black loam; porous subsoil.

GLENLOGGIE—Light brown soil; rocky subsoil.

MEIKLE ENDOVIE—Loam.



TABLE IV.—EXPERIMENT IX. LAUDERDALE AGRICULTURAL SOCIETY.  
A.—Nitrate of Soda, 120 lb. per acre.

	1	2	3	4	5	6
	Applied at once. All at sowing.	Applied at twice. $\frac{1}{2}$ at sowing. $\frac{1}{2}$ after singling.	Applied at thrice. $\frac{1}{3}$ at sowing. $\frac{1}{3}$ after singling. $\frac{1}{3}$ 6 weeks later.	Applied at thrice. $\frac{1}{3}$ after singling. $\frac{1}{3}$ 6 weeks later. $\frac{1}{3}$ 12 weeks later.	No nitrogenous manure.	Unmanured.
	tons cwt. 10 10 $\frac{1}{2}$ 22 16 21 10 20 0 19 0 12 5	tons cwt. 11 3 22 10 24 19 18 17 $\frac{1}{2}$ 20 10 11 3	tons cwt. 10 18 22 18 21 11 18 15 16 0 11 0	tons cwt. 9 16 $\frac{1}{2}$ 21 6 20 16 16 12 $\frac{1}{2}$ 17 10 10 8 $\frac{1}{2}$	tons cwt. ... 19 2 17 6 16 15 16 10 7 4	tons cwt. ... ... 12 0 10 17 $\frac{1}{2}$ ... ...
Average	. 17 13	. 18 4	. 16 17	. 16 1	. 15 7	. ...
Boon	. 10 10 $\frac{1}{2}$	. 11 3	. 10 18	. 9 16 $\frac{1}{2}$	. ...	. ...
Wantonwalls	. 22 16	. 22 10	. 22 18	. 21 6	. 19 2	. ...
Huntington	. 21 10	. 24 19	. 21 11	. 20 16	. 17 6	. 12 0
Lylestone	. 20 0	. 18 17 $\frac{1}{2}$	. 18 15	. 16 12 $\frac{1}{2}$	. 16 15	. 10 17 $\frac{1}{2}$
Newbigging	. 19 0	. 20 10	. 16 0	. 17 10	. 16 10	. ...
Newmills	. 12 5	. 11 3	. 11 0	. 10 8 $\frac{1}{2}$	. 7 4	. ...

B.—*Sulphate of Ammonia*, 86 lb. per acre.

Boon	.	9	19 $\frac{1}{4}$	11	7	11	19 $\frac{1}{2}$	11	11 $\frac{1}{2}$	...	...
Wantonwalls	.	21	6	20	18	21	12	20	3	19	2
Huntington	.	21	4	22	5	21	17	22	18	20	9
Lylestone	.	21	2 $\frac{1}{2}$	19	7 $\frac{1}{2}$	18	7 $\frac{1}{2}$	20	5	17	12 $\frac{1}{2}$
Newbigging	.	15	0	15	0	13	0	14	0	15	0
Newmills	.	15	2	10	6	10	0	9	6	9	3
Average	.	17	6	16	10	16	3	16	7	16	7
											...

Notes.—Boon—Free gravelly loam.  
 Wantonwalls—Light gravelly soil.  
 Huntington—Light loam.

Lylestone—Light poor land.  
 Newbigging—Clay loam.  
 Newmills—Poor clay loam.

TABLE III.—EXPERIMENT IX.—INVERURIE AGRICULTURAL ASSOCIATION, &c  
A.—*Nitrate of Soda*, 120 lb. per acre.

	1 Applied all at sowing.	2 Applied $\frac{1}{2}$ at sowing. $\frac{1}{2}$ after singling.	3 Applied $\frac{1}{3}$ at sowing $\frac{1}{3}$ after singling. $\frac{1}{3}$ 6 weeks later.	4 Applied $\frac{1}{3}$ after singling. $\frac{1}{3}$ 6 weeks later. $\frac{1}{3}$ 12 weeks later.	5 No nitrogenous manure.
	tons cwt.	tons cwt.	tons cwt.	tons cwt.	tons cwt.
Heatherwick . . . . .	8 6 $\frac{1}{2}$	8 0	6 15	7 0	8 0
Eastertown, Old Meldrum . . . . .	12 17	12 13 $\frac{1}{2}$	12 19	13 6	13 6
Conglass . . . . .	12 15	14 0	13 19	16 8	15 4
Arnhall, Huntly . . . . .	11 1	10 17	10 7	10 14	11 3
Average . . . . .	11 5	11 7	11 0	11 17	11 18
B.— <i>Sulphate of Ammonia</i> , 86 lb. per acre.					
Heatherwick . . . . .	8 7	7 3	7 4	8 3 $\frac{1}{2}$	10 7
Eastertown, Old Meldrum . . . . .	15 12 $\frac{1}{2}$	14 6	13 6	10 12 $\frac{1}{2}$	12 17
Conglass . . . . .	14 17	15 18	14 12	16 7	19 16
Arnhall, Huntly . . . . .	13 18	13 13	16 6	15 3	15 16
Average . . . . .	13 3	12 15	12 17	12 11	14 14

Sulphate of  
potash.

Notes.—HEATHERWICK—Light friable soil, on granite subsoil.  
EASTERTOWN—Light hill soil. 750 feet above sea-level.

CONGLASS—Loam upon rocky bottom.  
ARNHALL—Light loam; damp clay subsoil.

## ANALYTICAL ASSOCIATIONS.

During the past year nineteen associations reported their analyses to the Society; and the number of samples passed by the Chemical Committee was 265, which is the largest number hitherto recorded (see p. 288). The increase is chiefly due to the large number of samples sent in by three associations—Arbroath, Wester Ross, and Turriff; and the secretaries of these associations are to be congratulated on the energy with which they are carrying on the work of their associations. The samples of the Arbroath Association consisted chiefly of linseed-cakes, and this has raised the number of cake analyses of the year to double its usual amount. It is satisfactory to find that there were no cases of deficiency among them.

There is an increase in the bone-meal and superphosphate samples, and a decrease in dissolved bones and dissolved compounds generally.

## DISSOLVED BONES.

The manure sold last year under the name of dissolved bones were almost all genuine. Four cases occurred in which the analysis of the manures showed that they could not be genuine dissolved bones, but on investigation it was found that, except in one case, they had been sold as “dissolved bone manures,” and that their classification as dissolved bones was due to error in filling up the schedules. The one exception was a compound made by Messrs Packard & Co., London, and supplied to their agents, Messrs W. Paterson & Co., Dingwall, as “dissolved bones.” When asked to certify if the manure was really what it pretended to be, and what, from the name it bore, it ought to have been, Messrs Packard & Co. replied as follows: “If you mean by pure dissolved bones, ‘bone and acid only,’ the article you had from us last year and the previous year does not *quite* answer that description, although the analyses of the two articles are pretty much the same in both. *Absolutely* pure dissolved bones is a little difficult to get into perfect condition, and to secure this in your lot we had to use a small quantity of driers.” The analysis of the manure referred to was—

	Per cent.
Soluble phosphate . . . . .	23.18
Insoluble phosphate . . . . .	6.98
Ammonia . . . . .	2.86

With such a composition it is evident that the manure was simply a dissolved compound containing phosphate and

## PURCHASES BY ANALYTICAL ASSOCIATIONS, 1891.

	Bone-meal.	Steamed bone-flour.	Dissolved bones.	Superphosphate.	Slag.	Fish-manures.	Compound manures.	Nitrate of soda.	Sulphate of ammonia.	Potash-manure.	Linseed-cake.	Other cakes.	Meals and grains.	Peruvian guano.	Complete analysis.	Partial analysis.	Total.	(GRANTS.		
																		£	s.	d.
1. Alford	4	...	...	2	2	...	1	2	...	...	4	...	...	...	6	9	15	6	0	0
2. Arbroath	3	...	...	2	1	...	3	2	1	...	26	3	1	...	38	5	43	20	5	0
3. Arundale	1	...	2	1	1	...	...	1	1	...	...	...	...	...	3	4	7	2	10	0
4. Buchan	3	...	...	3	1	...	...	...	...	...	2	...	1	...	3	4	7	2	10	0
5. Carse of Gowrie	1	...	2	1	...	...	...	...	...	...	...	...	...	...	6	1	7	3	5	0
6. Galston	1	...	2	...	...	...	...	...	...	...	...	...	...	...	3	...	3	1	10	0
7. Grougar	1	...	2	...	1	...	...	1	1	...	...	...	...	...	3	...	3	1	10	0
8. Kelso	2	1	...	3	2	1	...	...	...	...	1	2	1	...	1	3	4	1	5	0
9. Kintyre	...	...	2	2	1	...	...	2	...	...	...	...	...	...	2	5	7	2	5	0
10. Kirkcudbright	6	...	3	4	...	1	...	...	...	...	...	...	...	...	10	4	14	6	0	0
11. Kirriemuir	1	1	...	1	...	...	2	1	...	1	2	...	...	...	6	3	9	3	15	0
12. Lanark	1	1	1	1	1	...	6	1	1	1	...	...	...	...	9	7	16	6	5	0
13. Moray	4	...	...	3	...	3	...	...	...	...	...	...	...	...	7	3	10	4	5	0
14. Nairn	10	1	1	7	...	3	...	...	...	...	...	...	...	...	14	8	22	9	0	0
15. Easter Ross	3	...	...	3	...	...	...	1	...	...	2	...	2	...	7	4	11	4	10	0
16. Wester Ross	7	4	1	9	...	...	1	1	...	3	3	...	...	1	17	13	30	11	15	0
17. Stoneykirk	9	1	1	3	1	...	...	1	...	1	...	...	...	...	7	6	13	5	0	0
18. Strathearn	1	1	1	2	...	...	2	...	...	...	...	...	1	...	6	2	7	3	0	0
19. Turriff	6	...	...	3	2	...	6	3	1	...	5	...	...	...	17	9	26	10	15	0
Total	61	9	19	52	12	8	21	16	5	6	45	5	6	1	174	92	265	109	10	0

ammonia derived from other substances than bone, and the explanation given is erroneous and misleading.

#### THOMAS-SLAG.

There is again an increase in the number of slag samples. Four samples were found to be considerably under their guarantee. They were guaranteed to contain 35 per cent phosphate, but were found to contain little over 30 per cent. The makers explained that, owing to a strike in the iron trade a number of furnaces had to be damped down, and they had to make their steel from iron bought in the open market, and as the amount of phosphorus contained in the iron varied, their calculations as to the composition of the slag were entirely upset. The Committee considered the explanation satisfactory. The deficiency of 4 or 5 per cent phosphate is of course important, but it has a precise market value, for which a suitable allowance can be made. A much more serious deficiency in a slag phosphate is deficiency in fineness of grinding. In almost all the purchases reported by the associations, there is nothing said about fineness. It does not form part of the guarantee, and yet it is the most important quality for the success of the manure. The fineness that ought to be insisted on in the purchase of basic slag, and also in the purchase of ground mineral phosphates, is that 80 per cent of the manure should be able to pass through a sieve of 10,000 holes in the square inch.

There has been a considerable fall in the price of mineral phosphate, due perhaps to the abundance and cheapness of Thomas-slag; and the attention of farmers is being drawn to the fact that these mineral phosphates can now be bought as cheaply as slag, and that they are as good a bargain manurially. In order that they may be so, they must, in the first place, be as rich in phosphate, and, in the second place, they must be as finely ground; but even then it is doubtful if any mineral phosphate will be able to hold its own against Thomas-slag, for the phosphates in the slag are of a less insoluble kind than the phosphates in minerals, and the presence of caustic lime in the manure is also very beneficial in some cases. Before using any mineral phosphate as a substitute for slag, it would be expedient to make a comparative test on a small scale.

#### DEFICIENT MANURES.

The district where deficient manures have been chiefly bought is the Lanark district. Out of sixteen manures analysed for the Lanarkshire Association, four were found deficient. Two of these were supplied by Mr S. M. Thomson, viz. :—

*Bone-meal (No. 11).*

	Guaranteed.	Found. Association sample.	Society's duplicate.
Phosphate . . .	46	40.6	48.04
Ammonia . . .	5	3.4	4.00

The deficiency at first seemed rather serious, but the analysis of the duplicate sample sent to the Secretary of the Society revealed a better state of matters. The mistake the seller has made is the somewhat unusual one of giving an analytical guarantee of a substance which he had not analysed. He admits that he ought not to have given so high a guarantee.

His other deficient manure is—

*Dissolved Bone-manure (No. 16).*

	Guaranteed.	Found.	Society's duplicate.
Soluble phosphate . . .	20	16.68	15.01
Insoluble phosphate . . .	14	8.32	11.24
Ammonia . . .	3	2.33	2.00

This is a manure in every way inferior to its guarantee, and Mr Thomson says simply that he cannot make out how the deficiency has occurred.

The other two deficient manures were supplied by Mr James Muirhead. They were—

*Steamed Bone-flour (No. 4).*

	Guaranteed.	Found.	Society's duplicate.
Phosphate . . .	60	54.08	55.86
Ammonia . . .	2	1.78	1.57

*Dissolved Bones (No. 8).*

Soluble phosphate . . .	20	16.68	16.76
Insoluble phosphate . . .	10	8.32	9.49
Ammonia . . .	2	2.61	2.30

The deficiencies in these two cases are not serious, but they are greater than ought to occur in any circumstances. The seller has no explanation to offer.

Out of the forty-three samples analysed for the Arbroath Analytical Association, one was found below its guarantee, viz. :—

*Special Dissolved Bone Compound (No. 35)*, supplied by the London Manure Company (Limited), 116 Fenchurch Street, London.

	Guaranteed.	Found.	Society's sample.
Soluble phosphate . . .	20 to 22	23.36	21.12
Insoluble phosphate . . .	12 to 14	4.68	5.97
Ammonia . . .	2½ to 3	1.85	1.83

The analysis of the association's chemist and that of the duplicate sample retained for the use of the Society's Chemical Committee agree well enough to make it certain that there was a great deficiency in the manure. The analysis of the Society's sample was made several months later than the other, and the difference in the two results is seen to be due to "reversion," whereby some of the soluble phosphate has become insoluble. The total phosphate found was 27 or 28 per cent, and that guaranteed was 32 to 36 per cent, so that one-fifth of the phosphate was wanting, while the ammonia was still more deficient—less than three-fourths of the amount guaranteed. The price of the manure was £6 per ton, and the valuation by the Society's units, which were certainly on a very liberal scale, was £4, 17s. 6d. per ton.

The form of guarantee is of the misleading kind that used to be common in Scotland. If it has any meaning worthy of respect, it must signify that the purchaser may expect to find that the ingredients guaranteed will vary somewhere between the higher and lower percentages given, but that in no case will they fall below the lower one. In the sellers' circular there occurs the sentence: "In all cases our guarantee extends to the minimum specified, and any excess of one fertilising ingredient is to be taken into account against a deficiency of another." This is a survival of the bad old guarantees against which the Committee have in former years warned the members of the Society. There is need to repeat the warning. The manurial experiments carried on under the Society's auspices in various parts of Scotland, have shown that there is a certain ratio of manurial ingredients—of ammonia to phosphates—which is found to be most appropriate for certain purposes, and to ask that a deficiency in the one should be balanced by an excess in the other is an absurdity. This, however, is what the sellers ask in this instance. They suggest that the deficiency in ammonia is balanced by the excess in soluble phosphate, and they entirely ignore the fact that the insoluble phosphate does not amount to half the quantity guaranteed. On the same principle, a tailor supplying a suit of clothes might suggest that a deficiency in the length of the coat, and a still greater deficiency in the size of the vest, might be balanced by a considerable addition to the length of the trousers. The sellers refer to an analysis of a sample of the manure drawn by their agent showing 26 per cent soluble phosphate, 6 per cent insoluble phosphate, and 2 per cent of ammonia; but as the sample was not sealed nor witnessed, it is of no value in this transaction. It evidently does not represent the material bought by the association, and is, moreover, grossly at variance with the guarantee.



These are the only cases of deficiency of any importance that occurred in the purchases reported by the associations last season. Several other cases were reported; but it was found, on making analyses of the duplicate samples, that the reports of the chemists of the associations were at fault.

## EXPERIMENTS WITH BORDEAUX SPRAY TO PREVENT POTATO DISEASE.

By Dr A. P. AITKEN.

At the request of the Board of Agriculture, the Directors of the Highland and Agricultural Society undertook experiments in different parts of the country to test the efficacy of the Bordeaux Spray as a preventive of potato disease. These were tried on the farms of Mr James Hope, East Barns, Haddingtonshire; Mr William Whyte, Hatton of Eassie, Forfarshire; and Mr John Thomson, Dennistoun, Renfrewshire. They were under the charge of three members of the Chemical Committee—Mr R. Shirra Gibb, Boon, Lauder; Mr W. S. Ferguson, Pictstonhill, Perth; and Mr John Speir, Newton, Glasgow—along with Dr Aitken, Chemist to the Society, who procured and prepared the materials for the spray, and superintended its application to the leaves of the potatoes on all occasions.

The mixtures applied were two, viz.:—

<i>Mixture A.</i>				Per acre.
Sulphate of copper (bluestone) <sup>1</sup>	.	.	.	20 lb.
Burnt lime (lime-shell)	.	.	.	10 lb.
Water	.	.	.	80 gallons.
<i>Mixture B.</i>				Per acre.
Sulphate of copper	.	.	.	15 lb.
Burnt lime	.	.	.	5 lb.
Water	.	.	.	80 gallons.

These quantities for application to an acre were recommended by the Board of Agriculture, who further suggested that probably half these quantities per acre might be sufficient; or, in other words, each of these doses might be sufficient for two acres instead of one. Accordingly, both full

<sup>1</sup> The sulphate of copper used in these experiments was common commercial bluestone, containing nearly 20 per cent of sulphate of iron.

doses and half doses were tried at all the three stations. These will be referred to as  $\frac{1}{2}$  A and  $\frac{1}{2}$  B in this report.

Inasmuch as mixture A is the one which has been chiefly used on the Continent, and which is recommended by the inventors of the *cure*, it was decided to try it on two plots at all the stations, while the others were limited to one plot each.

Each plot was about one-sixth of an acre in extent, consisting of six drills varying from 170 to 214 yards long, according to the size of the field, and separated from each other by blank plots of from six to twelve drills. The plots at Dennistoun were somewhat narrower, owing to the narrowness of the field. There was thus somewhat less than an acre under spray at each farm, and this was preferred to making experiments on a larger scale, as it enabled each test to be made upon soil of uniform quality, and under uniform conditions as to weather.

The plots were sprayed twice at each farm, once in July and once in August, with an interval of from a fortnight to three weeks between the two applications. The traces of the first application were distinctly visible on the leaves when the second application was made, notwithstanding that a good deal of rain had fallen in the interim.

The spray was applied by one man on each occasion with the Eclair Sprayer, using the medium-sized nozzle, which delivered the spray very uniformly. In order to apply the spray at the rate of 80 gallons per acre, it was found necessary to go over each drill twice; and in order to make a fairly efficient distribution of the spray on the leaves, the man walked up the one side of the drill and down the other, holding the sprayer in a slanting position, so that the spray might be able to reach the lower as well as the upper leaves. The double application of the spray to a drill of 200 yards long occupied about a quarter of an hour when the best results were attained, and this included the time occupied in refilling the copper vessel which the man carried on his back. The refilling of the vessel was done by another man or a boy, who might easily perform that service to three or four men engaged in spraying.

A careful examination of the leaves after the double application showed that even with the most regular spraying many leaves entirely escaped the action of the spray owing to their being protected by the leaves above them, while many others were very imperfectly sprinkled. When the best result is attained, about three-fourths of the leaves will be found to have been sprayed more or less perfectly on their upper surface; but the under surfaces for the most part escape the action of the

spray. On this account, however effective the mixture may be as a destroyer of the fungus, it is vain to hope that the disease can be wholly prevented by its use.

When the spray was applied at the rate of 40 gallons per acre, the covering of the leaves was much less efficient, for in that case each drill received only one application from the sprayer, which was pointed straight down upon the drill from a considerable altitude, so that the liquid might be as widely distributed as possible.

The mixture was made in the following manner. The sulphate of copper, ground to powder, was put into a coarse canvas bag and suspended in a pail of very hot water, and a second or third pailful of hot water was used, so as to expedite the solution. When all was dissolved, it was put into a large tub or barrel, to which about two-thirds of the whole quantity of cold water was added. Meantime the proper quantity of burnt lime was put into a pail and thoroughly slaked. When that was accomplished, water was added to the pail and the whole stirred, allowed to subside a few seconds, and then poured into the sulphate of copper solution. This was repeated again and again, till no more milk of lime was found. Water was then added to the tub containing the mixture until it was diluted to the proper strength.

The mixture of the milk of lime with the sulphate of copper solution causes a voluminous blue precipitate, which rapidly becomes black if the sulphate of copper contains any sulphate of iron, as commercial bluestone usually does. It is this blue or black precipitate that is intended to be effective in destroying the fungus. It is a heavy precipitate, which rapidly subsides, leaving a clear alkaline solution above, which is just lime-water. It is important that lime of good quality be used, and that it should not be allowed to lie long before using, lest it lose causticity, and be incapable of neutralising the acidity of the sulphate of copper, which would then do injury to the leaves of the potato-plant. The mixture, when made, consists chiefly of basic sulphate of copper, sulphate of lime, and lime-water.

The leaves were visibly coloured by the spray; but in no case was it found to do injury to the leaf, or visibly to retard the growth of the plant. Owing to the heaviness of the precipitate, it is necessary to thoroughly stir the mixture in the tub each time that a quantity is taken out to fill the copper vessel, and care has to be taken to prevent shreds of straw or other dirt from getting into the mixture, as they are apt to choke the nozzle of the sprayer, and cause loss of time in their removal.

The farms of Dennistoun and Hatton of Eassie were selected as being very liable to disease; but, unfortunately for the success of the experiment, there was this year less disease on these

farms than usual. East Barns was chosen on account of the great importance of the potato crop in the Dunbar district. The potatoes there are not specially liable to disease, but the experiment was tried upon a small level field where a kind of potato was grown that had shown itself very liable to disease the previous year, and, as will be seen by the subjoined table of results, the disease was again very prevalent.

When the potatoes were lifted, it was deemed expedient to confine the test to the two centre drills of each plot, for, owing to the evident evenness of the plots, these two were quite representative of the whole, and from their position they were necessarily more perfectly sprayed than the outer drills, which might have lost some of the spray owing to the action of wind. This method had the further advantage of enabling the whole lifting to be done in a few hours, under the superintendence of those responsible for the accuracy of the experiments.

When the potatoes were lifted they were pitted, and allowed to lie in the pits for a few weeks in order to give the disease a better chance of making progress. At Dennistoun farm the potatoes were tested both at the time of lifting and after being stored for a month, and on each occasion only one drill was selected as representative of the plot.

Repeated observations were made during the growing season, but in no case was any distinction visible among the plots. The drills that were sprayed, and the undressed drills between, grew quite uniformly; and when disease appeared on the leaves it seemed to be fairly distributed over the whole area.

The results obtained at the different farms were as follow:—

#### EXPERIMENTS AT EAST BARNS, DUNBAR.

Size of plots—breadth, six drills; length, 176 yards. Separated from each other by breadths of twelve drills unsprayed.

Variety of potatoes—Sutton's Abundance.

Sprayed—July 24 and August 6.

Lifted and pitted—October 9.

Assorted and weighed—November 21.

*Produce of two-drill plots. 160 yards long (= 320 yards).*

Plot.	Mixture.	Healthy. lb.	Diseased. lb.
1.	A .	555	563
2.	A .	552	611
3.	B .	539	508
4.	$\frac{1}{2}$ A	472	671
5.	$\frac{1}{2}$ B	488	630
Two drills between plots 1 and 2			
	(nothing) . . . .	575	451
Two drills between plots 2 and 3			
	(nothing) . . . .	516	661

## EXPERIMENTS AT HATTON OF EASSIE, FORFARSHIRE.

Size of plots—breadth, six drills; length, 214 yards. Separated by breadths of six drills unsprayed.

Variety of potato—Common Regents.

Sprayed—July 20 and August 3.

Lifted and pitted—October 12.

Assorted and weighed—December 5.

*Produce of two-drill plots. 180 yards long (= 360 yards).*

Plot.	Mixture.	Healthy. lb.	Diseased. lb.
1.	A . . . . .	860	187
2.	A . . . . .	962	300
3.	B . . . . .	1018	207
4.	$\frac{1}{2}$ A . . . . .	672	192
5.	$\frac{1}{2}$ B . . . . .	955	179
	Between plots 1 and 2 (nothing) . . . . .	943	187
	Between plots 2 and 3 (nothing) . . . . .	1015	249

## EXPERIMENTS AT DENNISTOUN, RENFREWSHIRE.

Size of plots—breadth, three or four drills; length, 170 yards. Separated by breadths of four drills unsprayed.

Varieties of potatoes—Regents and Sutton's Abundance.

Sprayed—July 9 and 31.

Lifted, assorted, and weighed—October 16.

*100 yards, Regents.*

Plot.	Mixture.	Healthy. lb.	Diseased. lb.
1.	A . . . . .	345	36
2.	A . . . . .	323	17
3.	$\frac{1}{2}$ A . . . . .	378	36
	Between plots 1 and 2 (nothing) . . . . .	350	32

*100 yards, Sutton's Abundance.*

4.	B . . . . .	365	2
5.	$\frac{1}{2}$ B . . . . .	353	2
	Between plots 4 and 5 (nothing) . . . . .	377	4

In addition to this test, 60 yards of a drill on plots 1, 2, and 3 were pitted, and a month thereafter were assorted and weighed, with the following result:—

Plot.	Healthy. lb.	Diseased. lb.
1 . . . . .	224	23
2 . . . . .	214	21
3 . . . . .	216	22

The general and quite evident conclusion to be drawn from these experiments is that the Bordeaux Spray, applied as described, has entirely failed to have any restraining effect whatever on the progress of the potato disease.

In view of the different results obtained elsewhere, it will

not do to conclude from these experiments that the Bordeaux Spray is useless. We must rather endeavour to find a reason for its failure in Scotland. The only reason which occurs to me as a probable one is that the spray was applied too early. Had it been applied a month later, it would certainly have been more seasonable; for though signs of disease appeared early in some places, its course was arrested owing to some cause—probably some climatic condition—and it did not re-appear until late in the season, when it spread with great rapidity. Had the spray been applied in September, it would have been more seasonable in the circumstances, but whether it would have been more successful is open to considerable doubt; for, in the first place, it was observed at all the stations that the copper precipitate remained persistently on the leaves which it succeeded in reaching, and was not washed off even by heavy rains. I have repeatedly walked through potato drills after heavy showers, and have been surprised to find how little they have been wetted. The nature of the leaf is such as to throw off drops of rain and leave its surface dry. The kind of rain which is able to drench the leaves of the potato-plant is a heavy mist somewhat resembling the spray, and such rain would not be liable to dislodge the basic sulphate of copper, which is insoluble, and clings tenaciously to the leaves. On the other hand, the sulphate of lime, which is a component of the spray, would be dissolved away, for it is soluble in water. The lime-water of the spray, after drying on the leaves, will immediately be converted into insoluble carbonate of lime; but as the leaves are continually exhaling carbonic acid, it is probable that thereby the carbonate of lime will be rapidly converted into bicarbonate of lime, which is soluble in water, so that ultimately the only residue of the spray persisting on the leaves will be the basic sulphate of copper. This insoluble substance will probably protect that part of the leaf on which it is deposited, but whether it is capable of exerting a protective influence on parts adjacent to it I do not know.

In the second place, the application of the spray late in the season cannot be other than very partial, for by that time the leaves will have completely met in the drills, and even if it were possible for a man to walk between the drills with any degree of comfort and steadiness, the upper growth of the plants would almost completely protect the lower leaves from receiving any share of the spray.

On the whole, I am of opinion that if the Bordeaux Spray is a protective against the potato disease it will be so only when the disease attacks the plants while they are still young, and their whole surface capable of being reached by repeated spraying. That this cannot be attained by simply directing the

spray on the plants from above is evident, and as it is perhaps equally or even more important that the under surfaces of the leaves should be protected, some more perfect manner of applying the spray would have to be adopted. But, on the other hand, I rather think that such complete drenching of the young plant with the spray might seriously impair its vitality, and be even worse than the disease.

The fact that the plants in the above experiments showed no signs of injury from the application of the spray may be easily explained on the ground that they were well grown before the treatment began, and that only a fraction of their surface was affected by it.

## EXPERIMENTS ON THE PREVENTION OF POTATO DISEASE BY SULPHATE OF COPPER AND LIME.

By JOHN SPEIR, Newton Farm, Newton, Glasgow.

THE varieties of potatoes experimented on by me were very early, or moderately early, varieties, all very subject to the disease, and comprised Don, Red Bog, and Regent. Don is the earliest variety in general cultivation in Scotland, the tuber being white and round, and very liable to disease. In ordinary seasons it ripens naturally in August or the beginning of September. Red Bog is a species of the Regent, ready to dig about two weeks before it, but resembling it very much both in quality, shape, and leaf. It is if anything more subject to disease than the Regent. Regent, I presume, is known to every one interested in potatoes.

The ground of all the experimental plots was very much the same, being a light red sandy loam, naturally dry, and well suited to the growth of these varieties, and even in a bad year of disease not at all liable to be badly affected. The previous crop was hay, from which two cuts were taken in 1890. The manure used was stable manure well rotted, rather too much in fact, which was applied at the rate of from 30 to 35 tons per acre in the drill, no artificial manures of any kind being used, then or later. In the Don experiment the drills were 250 yards long and 27 inches wide; in the Red Bogs they were 250 yards long also, but 28 inches wide; while in the Regent plot the drills were 122 yards long and 28 inches wide.

A separate experiment was made with Dons in garden soil, the whole area of the plot being one pole.

The material used was applied both as liquid and powder, the liquid being applied by the Eclairé Sprayer, and the powder

by the knapsack distributor, both being manufactured by M Vermorelle of Villefranche, Rhone, France.

The full dressings were applied by going twice along every drill, the liquid or powder being driven among the leaves first from the one side of the drill and then from the other. In the half dressing, it was blown in on the top of the drill, and was only done once. The materials used were as follows:—

*A Mixture.*

Sulphate of copper (commercial)	.	.	10 lb.
Lime-shell	.	.	5 "
In from 80 to 90 gallons of water, and used at that rate per acre.			

*B Mixture.*

Sulphate of copper (commercial)	.	.	15 lb.
Lime-shell	.	.	5 "
In from 80 to 90 gallons of water, and used at that rate per acre.			

The powder is a mixture of sulphate of copper and lime, in about the same proportions, with the addition of some other substances, and was supplied by Buchanan Brothers, Glasgow and is sold by them under the name of Antibligh. This powder was used at the rate of from 3 lb. to 7 lb. per acre, as without moving extraordinarily slow, or going over the ground oftener than twice, the machine could not put it on thicker. The experiment was conducted as follows on the Dons:—

Drill.

1. Nothing.
- 2-4. Full A mixture applied to both sides of the drill.
- 5-7. Nothing.
- 8-11. Half A mixture applied at once along the top.
- 12-14. Powder applied to both sides of the drill.
- 15-18. Full A mixture to both sides of the drill.
- 19-21. Nothing.
- 22-24. Half A mixture to top of drill.
- 25-28. Powder to both sides of the drill.

On the Red Bogs the experiment consisted of—

Drill.

- 1-4. Full A mixture to both sides of the drill.
- 5-8. Nothing.
- 9-12. Powder to both sides of the drill.

On the Regent plot the experiment was carried out as follows:—

Drill.

- 1-6. Full A mixture.
- 7-12. Full B mixture.
- 13-18. Powder.
- 19-21. Nothing.
- 22-27. Half A mixture.
- 27-33. Half B mixture.
- 34-36. Nothing.

Drill.

- 37-42. Full A mixture.
- 43-48. Full B mixture.
- 49-54. Powder.
- 55-57. Nothing.
- 58-63. Half A mixture.
- 64-69. Half B mixture.



Another plot of two acres of Regents was dressed twice with powder, at the rate of from 6 lb. to 8 lb. each time.

The Dons and Red Bogs were first dressed on 11th July, at the rate of from 80 to 90 gallons per acre; the Regents on the 13th July; and the Regents (2 acres) with powder on the 15th July.

At this time the plants were fully closed in the drills, the foliage was very luxuriant, and weather dry.

The second dressing was applied as under:—

To Dons and Red Bogs, on 29th July.

To Regents, on 30th July.

To half Regents powder, on 1st August.

To half Regents powder, on 8th August.

The weather was dry at the second application of the liquid dressing, but was damp at the time the second half of the Regents plot was dressed with powder.

None of the applications appeared to do any damage to any of the plots, and none of them had any effect in prolonging growth or in giving a healthier appearance, as has been stated by many experimenters. Little appearance of disease was seen on the leaves at any time; but after a heavy storm early in September, when the leaves were much bruised, they blackened very quick.

From the first date of dressing till the withering of the stalks, I repeatedly visited all the plots; but on no occasion could I pick out, without the reference sheet, a single set of either dressed or undressed drills. Several visitors to the farm, who were interested in the matter, were also asked if they could do so, but never in a single instance were they successful.

As soon as the leaves had thoroughly disappeared, I made a careful examination of each plot, by lifting three or four shaws at several places, carefully examining every tuber, when I was disappointed to find that neither in weight of produce nor percentage of disease did the dressed plots show any superiority over the undressed ones. All lots were as uniformly the same as they could well be, supposing they had had nothing applied to them at all. There were variations, but these were as much apparent in the dressed as in the undressed plots, and when averaged were all, practically speaking, alike. The percentage of diseased roots ran from 10 to 15 per cent of the whole, with an occasional jump up to 25 per cent. I therefore considered it unnecessary to go to the trouble of specially selecting and weighing each plot separately, as apparently nothing would be gained thereby. The crops were dug in the beginning of October, and while this was in progress, Mr Allan Buchanan, of Buchanan Brothers, who had supplied the powder, called to

see the result. The undug portions of the experimental plots in the Regents were again gone over, by raising four plants at a place, with the result that no apparent advantage could be seen of any one over another.

The plot of Dons in the garden was raised on 22d October, when it was found that the dressed drills showed no advantage of total quantity of produce over the undressed ones; but that while the former contained 70 per cent of sound ones, the latter had only 57 per cent sound. The potatoes in this plot were planted in 18-inch drills, and had been dressed with powder four or five times, at intervals of a couple of weeks, from the middle of June.

In tubs 2 feet in diameter I had single Don plants growing, three of which were dressed with powder and three undressed. The tubs were filled with earth from where potato pits had been for several years previously, and all were buried in the soil up to the rim. On examining these after the leaves had died down, only one single potato was found in the whole lot, and that at one of the undressed ones. Each plant was very healthy, and placed three yards from its neighbour.

---



## APPENDIX (A).

### PROCEEDINGS AT BOARD MEETINGS.

#### MEETING OF DIRECTORS, 4TH FEBRUARY 1891.

*Present.*—*Ordinary Directors*—Mr Elliot of Wolfelee; Sir Jas. H. Gibson-Craig, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Macduff of Bonhard; Mr Ballingall, Dunbog; Mr Ford, Fentonbarns; Mr Lumsden of Balmedie; Mr Shirra Gibb, Boon; Mr Gilmour of Montrave; Mr Fisher, Jellyholm; Mr Glendinning, Hatton Mains; Mr Gordon of Newton; Mr Aitken, Norwood; Mr Ferguson, Pictstonhill; Mr M'Gibbon, Ardnacraig; Mr Elliot, Hollybush. *Extraordinary Directors*—Colonel Williamson of Lawers; Mr Martin of Auchendennan; Mr Craig, Innergeldie; Sir Robert Menzies, Bart.; Mr Kerr, Broomhouse; Mr Elliot, Blackhaugh; Mr Buttar, Corston; Mr Murdoch, Garteraig; Mr Howatson of Glenbuck. *Engineer*—Mr Jas. D. Park.

Mr F. N. MENZIES reported apologies for the absence of Hon. R. Baillie Hamilton; Sir Wm. S. Walker, K.C.B.; Mr Cran, Kirkton; Mr T. D. Findlay, Bonnington; Mr Lockhart, Mains of Airdies; Mr Mackenzie of Portmore; Mr M'Queen of Crofts; Mr Maxwell, yr. of Munches; Mr Middleton, Clay of Allan; Mr Wardlaw Ramsay of Whitehill; Mr Stirling of Kippendavie; Mr Walker, Portlethen; and Dr A. P. Aitken.

A letter was read from the Earl of Strathmore, returning his sincere thanks for the compliment which the members of the Society had been so good as to offer him at the General Meeting on 21st of last month.

#### BEE HUSBANDRY.

A letter was read from Mr Gibson Carmichael, asking the Society to give encouragement to bee husbandry. The Directors instructed the Secretary to reply that they felt deeply interested in the subject, but it was delayed in the meantime.

#### DAIRY DEPARTMENT.

The minute of the Special Committee was approved of, making proposals to the Board of Agriculture for the examination of pupils from dairy schools. A letter from the Secretary of the Angus and Mearns Dairy School applying for a grant was read. The Directors instructed the Secretary to bring it up at the December meeting, when the money will be divided.

#### PREMIUMS FOR REPORTS.

It was agreed to add the following premiums for competition to the prize-list: The most economical method of feeding farm-horses, and on permanent timothy-grass meadows.

#### BREEDING OF DAIRY STOCK.

A letter was read from the Baron Arthur de Hohenbrucke, Vienna, asking the Society if it could arrange that when cattle-shows afford the opportunity, after the manner of agricultural societies of Germany, the following measurements and observations in connection with the yield of milk could be permanently recorded—viz.: (a) measurement of the body, chest, and hind-quarters, and observations on the size of the interspaces between the ribs; (b) observations on the character of the udder, milkveins, skin, hair, and horns. The Directors instructed the Secretary to reply that they regretted that not having prizes for milking, they could not undertake to collect the information asked.

## MEETING OF DIRECTORS, 4TH MARCH 1891.

*Present.—Ordinary Directors*—Mr Elliot of Wolfelee; Mr Mackenzie, Dalmore; Sir James H. Gibson-Craig of Riccarton, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald Manse; Mr Macduff of Bonhard; Mr Ballingall, Dumbog; Mr Ford, Fentonbarns; Mr Lumsden of Balmedie; Mr Maxwell, yr. of Munches; Mr Shirra Gibb, Boon; Mr Fisher, Jellyholm; Mr Wardlaw Ramsay of Whitehill; Mr Wilken, Waterside of Forbes; Mr Lockhart, Mains of Airies; Mr Cran, Kirkton; the Hon. the Master of Polwarth; Mr Glendinning, Hatton Mains; Mr Aitken, Norwood; Mr M'Gibbon, Ardnacraig. *Extraordinary Directors*—Provost Yellowlees, Stirling; Mr Mitchell, Alloa; Sir Robert Menzies, Bart.; Mr Kerr, Broomhouse; Mr M'Queen of Crofts; Mr Buttar, Corston; Mr Murdoch, Garterraig; Mr Howatson of Glenbuck. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr W. Home Cook, C.A. *Botanist*—Mr A. N. M'Alpine. *Engineer*—Mr James D. Park. *Chairman of Machinery Committee*—Mr Middleton, Clay of Allan. Mr Elliot of Wolfelee in the chair.

Mr F. N. MENZIES reported apologies for the absence of Lord Elphinstone; the Hon. R. Baillie Hamilton; Sir Graham Montgomery, Bart.; Mr Craig, Innergeldie; Mr Elliot, Hollybush; Mr Forbes of Culloden; Mr Gilmour of Montrave; Mr Gordon of Newton; Mr Stirling of Kippendavie; and Mr Walker, Portlithen.

## CHEMICAL DEPARTMENT.

The Units for the Valuation of Manures were laid upon the table, and the Secretary reported that he had sent copies to all the local Analytical Associations.

## AGRICULTURAL EDUCATION.

The SECRETARY reported that the examinations for the Society's Agricultural Diploma and Certificate and Forestry Certificate would take place on the 24th, 25th, and 26th instant, candidates being required to lodge intimation before the 16th.

## TECHNICAL EDUCATION.

On the motion of the Rev. JOHN GILLESPIE, seconded by Sir JAMES GIBSON-CRAIG, the following Committee was appointed to consider what steps should be taken with reference to the Government grant provided for technical education in Scotland—viz., Rev. John Gillespie, *Convener*; Sir James Gibson-Craig, Bart.; Mr Wardlaw Ramsay, the Master of Polwarth, Mr Middleton, Mr Marr, Mr Howatson, Dr Gibb.

## STIRLING SHOW, 1891.

Various Committees were nominated in connection with the Show arrangements.

## STIRLING AGRICULTURAL SOCIETY.

A letter was read from the secretary stating that they intended to hold their show this year as usual. The Directors unanimously resolved that a representation be sent to the Stirling Society, expressing the hope that they would not carry out their intention of holding their local show this year, as they felt confident that it would interfere materially both with the entries and with the attendance of the public.

## NORTH-WESTERN CATTLE TRADE AND FARMERS' DEFENCE ASSOCIATION.

A letter was read from the secretary sending a copy of petition addressed to the President of the Board of Agriculture with reference to restrictions on home cattle, the issuing of orders by Local Authorities, and unfair competition from the importation of live fat stock. After careful consideration, the Directors thought it inexpedient to move in the matter.

## NEW MEMBERS.

The following Committee were appointed to consider what steps should be taken to procure new members, more particularly in the Stirling district—viz., Sir James Maitland; Provost Yellowlees; Messrs Mitchell, Alloa; Martin of Auchendennan; Fisher, Jellyholm; Stirling of Kippendavie; Haig, Dollarfield; and Robert Taylor, Stirling.

PRESENTATION OF BOOKS.

The following books were presented to the Society—viz., volume xiii. of the 'Clydesdale Stud-Book,' and volume viii. of the 'Hackney Stud-Book.'

MEETING OF DIRECTORS, 1ST APRIL 1891.

*Present.—Ordinary Directors*—Mr Buchanan, Garscadden Mains; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Macduff of Bonhard; Mr Ballingall, Dunbog; Mr Ford, Fentonbarns; Mr Maxwell, yr. of Munches; Mr Shirra Gibb, Boon; Mr Gilmour of Montrave; Mr Fisher, Jellyholm; Mr Wardlaw Ramsay of Whitehill; Mr Wilken, Waterside of Forbes; the Hon. the Master of Polwarth; Mr Glendinning, Hatton Mains; Mr Ferguson, Pictstonhill; Mr M'Gibbon, Ardncraig. *Extraordinary Directors*—Mr Martin of Auchendennan; Mr Andrew Mitchell, Alloa; Mr Craig, Innergeldie; Sir Robert Menzies of Menzies, Bart.; Mr Kerr, Broomhouse; Mr Buttar, Corston; Mr Murdoch, Gartcraig; Mr Howatson of Glenbuck. *Hon. Secretary*—Sir G. Graham Montgomery, Bart. *Chemist*—Dr A. P. Aitken. *Engineer*—Mr J. D. Park. *Chairman of Machinery Committee*—Mr Middleton, Clay of Allan. Mr Buchanan in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Hon. R. Baillie Hamilton; Sir Jas. H. Gibson-Craig, Bart.; Mr Aitken, Norwood; Mr Cran, Kirkton; Mr Forbes of Culoden; Mr Gordon of Newton; Mr Elliot, Hollybush; Mr Lockhart, Mains of Airies; Mr Mackenzie, Dalmore; Mr M'Queen of Crofts; Mr Stirling of Kippendavie; and Provost Yellowlees, Stirling.

THE LATE MR T. G. MURRAY.

Before proceeding to the business on the programme, the Directors resolved to record in the minutes an expression of the sincere regret with which they have received the intimation of the death of Mr Thomas Graham Murray of Stenton, W.S., and their sense of the assistance rendered by him as a member of the Society for forty years, and as chairman of the Society's Committee on Law during the years 1883 to 1889.

AGRICULTURAL EDUCATION.

The reports of the agricultural and forestry examinations were submitted, showing that the written examinations were held on 24th and 25th, and the oral on 26th March. The number of candidates who presented themselves was 29—viz., 27 in the agricultural department, and 2 in the forestry department. The examinations resulted in 10 passing for the diploma and 12 for the first-class certificate in agriculture, and 1 for the first-class certificate in forestry.

Letters from Professors Wright and M'Call, postponed from last meeting, were considered, and the Board resolved to recommend to the Council on Education, who appoint the examiners for agricultural diploma, that as far as practicable the teaching element should be eliminated from the Examining Board, but that if teachers are appointed, the different agricultural schools should be represented by rotation or otherwise.

The Board nominated the following gentlemen to represent them in the Council on Education—viz.: The Master of Polwarth; Sir James Gibson-Craig, Bart.; Mr Wardlaw Ramsay of Whitehill; Mr Maxwell, yr. of Munches; Rev. John Gillespie; Mr Martin of Auchendennan; and Mr Marr, Cairnbrogie.

TECHNICAL EDUCATION.

The Committee appointed on 4th March to consider what steps should be taken with reference to the Government grant as to the means recently provided for technical education in Scotland, having arranged to take the opinion of counsel on the subject, met yesterday, and reported to the Directors that they had consulted Sir Chas. Pearson and Mr C. N. Johnston, the queries and opinions thereon being as follow:—

1. Under section 2 of the Local Taxation Act of 1890, does the provision to contribute for the purposes of "technical" education, within the meaning of the Technical Schools (Scotland) Act, 1887, mean that such technical education is to be of the character defined as "technical education" under the Technical Schools Act of 1887,

and that the money must be expended under the machinery provided for in the Act of 1887?

2. Is it in the power of County Councils or Burgh Commissioners, acting under section 2 of the Local Taxation Act of 1890, to give grants from their shares of the residue of the local taxation duties to colleges, schools, or classes in which technical instruction is given outwith their own area, provided that these colleges, schools, or classes are (1) used by, or (2) open to students coming from their respective counties or burghs?

3. Is it competent to County Councils and Police Commissioners, acting under clause 2 of the Act of 1890, to make their contributions for technical education by giving sums to existing colleges, schools, or classes giving technical instruction, or must they establish schools or classes of their own, and within their own territory, for that purpose?

4. Is it competent for County Councils or Police Commissioners, under said section, to make the whole or part of their contribution for technical education, in the shape of scholarships, to persons in their respective districts, to enable them to attend colleges, schools, or classes giving technical education outwith their respective territories?

*Opinions.*—1. The education must, in our opinion, be of the character defined as technical instruction under the Act of 1887. The question whether the same must be expended under the machinery provided for in that Act is not without difficulty, and is left somewhat obscure on the words of the enactment. But we are of opinion that in the expenditure of the money the Council or Commissioners are not restricted to the machinery provided in the Act of 1887.

2. We are of opinion in the affirmative.

3. We are of opinion that the powers of the expending bodies are confined to contributing to existing institutions, and do not extend to the establishment of new schools.

4. The question is attended with some difficulty, but, having regard to the origin of the funds at disposal, we are constrained to answer it in the negative. These funds are part of the public revenue of the nation derived from taxation. We should have great difficulty in holding, in the absence of an express provision to that effect, that the Legislature authorised their application as bursaries for certain favoured or selected individuals.

The Board, on the recommendation of the Committee, resolved that copies of the memorial, queries, and opinions be forwarded (1) through the county clerks to every county councillor in Scotland; (2) to agricultural societies in Scotland; (3) to school boards; (4) to those teachers who are conducting classes in agriculture under the Science and Art Department. They also recommended respectfully to county councils to make contributions towards the encouragement and assistance of agricultural education according to the special circumstances and requirements of each district. The following gentlemen were appointed a Standing Committee to carry out the above resolutions—viz.: Sir James Gibson-Craig, Bart.; Mr Wardlaw Ramsay, Mr Buttar, Mr Marr, Mr Walker, Mr Middleton, Mr Cran, Mr Martin, Mr Stirling, Mr Howatson, Mr Murdoch, Mr W. J. Maxwell, the Master of Polwarth, Mr Gibb, and the Rev. John Gillespie, convener.

#### GOVERNMENT GRANT.

The SECRETARY reported that he had received from the Board of Agriculture a grant of £150 in aid of agricultural experiments. The Secretary was instructed to thank the Board of Agriculture for the grant.

#### DAIRY DEPARTMENT.

At the request of the Board of Agriculture, Mr Gillespie was appointed to proceed to London to consider the scheme prepared for the uniformity of examination in dairy-work.

#### STIRLING SHOW.

The SECRETARY reported that two special prizes of £10 each had been offered by Mr Smith of Ardtornish, for the best male and female animals of the West Highland breed. He also reported that the Clydesdale Horse Society had written to notify the offer of their silver medal, and the ex-President's (Lord Polwarth) prize of ten guineas for the best Clydesdale stallion registered in the Clydesdale Stud-Book in the four sections for agricultural horses, and the same prizes in the five sections of mares.

It was remitted to a Committee in the district to nominate a Local Committee.

The following gentlemen were nominated stewards for the Stirling Show: *Horses*—Sir Allan Mackenzie, Bart. *Cattle*—Rev. John Gillespie. *Sheep, Swine, &c.*—Mr Walter Elliot. *Forage*—Mr Buttar. *Implements*—Mr Middleton and Mr Kerr.

#### FORAGE.

Mr Dewar, King's Park Farm, was appointed to supply forage for the Stirling Show, and a Committee was appointed to consider the question of the quantity of forage supplied free to exhibitors.

#### WORKING DAIRY.

After considerable discussion, it was resolved not to have a working dairy at Stirling Show.

#### STIRLING AGRICULTURAL SOCIETY.

A letter was read from Mr Taylor, secretary, intimating that his directors adhered to their resolution to hold their show this year. The Board were unanimous in regretting that the Stirling Society had come to the resolution.

#### CHEMICAL DEPARTMENT.

A draft report of the deficient manures supplied to the Analytical Associations was reported for publication in the Society's 'Transactions.'

#### NEW MEMBERS.

A Committee was appointed to consider the best method of increasing the membership of the Society.

#### PRESENTATION OF BOOKS.

The following books were presented to the Society's library, and accepted with thanks: Vol. xv. of the 'Polled Herd-Book,' and vol. xi. of the 'Galloway Herd-Book.'

#### MEETING OF DIRECTORS, 6TH MAY 1891.

*Present.—Ordinary Directors*—Mr Lorne Stewart of Coll; Mr Elliot of Wolfelee; Mr Buchanan, Garscadden Mains; Sir James H. Gibson-Craig, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Macduff of Bonhard; Sir James R. Maitland of Barrnton, Bart.; Mr Ballingall, Dunbog; Mr Lumsden of Balmedie; Mr Shirra Gibb, Boon; Mr Gilmour of Montrave; Mr Fisher, Jellyholm; Mr Wardlaw Ramsay of Whitehill; Mr Cran, Kirkton; the Hon. the Master of Polwarth; Mr Gordon of Newton; Mr Aitken, Norwood; and Mr Ferguson, Pictstonhill. *Extraordinary Directors*—Provost Yellowlees, Stirling; Mr Craig, Innergeldie; Sir Robert Menzies of Menzies, Bart.; Sir A. R. Mackenzie of Glenmuick, Bart.; Mr Kerr, Broomhouse; Mr M'Queen of Crofts; Captain Clayhills Henderson of Invergowie, R.N.; and Mr Buttar, Corston. *Chemist*—Dr A. P. Aitken. *Botanist*—Mr A. N. M'Alpine. *Engineer*—Mr J. D. Park. *Chairman of Machinery Committee*—Mr Middleton, Clay of Allan. Mr Marr, Cairnbrogie, in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Hon. R. Baillie Hamilton; Mr Anderson of Lochdhu; Mr Elliot, Hollybush; Mr Forbes of Culloden; Mr Macpherson Grant of Drumduan; Mr Howatson of Glenbuck; Mr Mackenzie of Dalmore; Mr Martin of Auchendennan; Mr Murdoch, Garterraig; Mr Stirling of Kippendavie; and Mr Wilken, Waterside of Forbes.

#### THE LATE MR T. D. FINDLAY OF EASTERHILL, AND THE LATE MR JOHN WILSON, WELLNAGE.

Before proceeding to the business on the programme, the following resolutions were adopted:—

That the Directors resolved to record in the minutes an expression of the deep regret with which they have received the intimation of the death of Mr Thomas Dunlop Findlay of Easterhill, one of their number, and their sense of the assistance rendered by him as a member of the Society for forty-four years, as a member of the Board during the years 1890-91, and as a judge at the Society's General Show on several occasions.



That the Directors resolved to record in the minutes an expression of the sincere regret with which they have received the intimation of the death of Mr John Wilson, Wellnage, and their sense of the assistance rendered by him as a member of the Society for forty years, as an Ordinary Director, and as a member of the Council, and an Examiner on Agricultural Education.

#### THE LATE MR T. G. MURRAY, W.S.

A letter was read from Mrs Murray, thanking the Directors for their resolution on the death of her husband.

#### GENERAL MEETING.

The General Meeting was fixed for 17th June.

#### GOVERNMENT GRANT.

The Directors having voted £75 to the investigation of abortion in cows, provided the remainder of the money required was collected by a Committee appointed, and the sum not having been yet subscribed, the matter was remitted back to the Committee to endeavour to raise more funds.

#### UNIFORMITY OF EXAMINATION IN DAIRY-WORK.

The Rev. JOHN GILLESPIE, who had been deputed to go to London on this subject, reported that a scheme had been formulated by the Board of Agriculture, providing for the appointment of a Council for granting diplomas and first and second class certificates to dairy workers. The Council is to be composed of four members of the Royal Agricultural Society, three from the Bath and West of England Society, three from the University of North Wales, and three from the Highland and Agricultural Society. It was also arranged that the real work of the Council should be carried out by an Executive Committee, and that there should be a separate Executive for Scotland.

#### TECHNICAL EDUCATION.

The SECRETARY reported that about 5000 circulars, copies of the report and opinion of counsel, had been issued, and it was remitted back to the Committee to watch over the matter and take any further steps that might be necessary.

#### STIRLING SHOW.

The Local Committee nominated by the Stirling Committee was reported. On the recommendation of a Special Committee it was agreed to give an unlimited supply of green food. The SECRETARY intimated that the last days of entry were as follows: Implements, 25th May; stock, poultry, and dairy produce by first post on the morning of 22d June.

A letter was read from Mr Howatson of Glenbuck, offering the following special prizes for blackfaced sheep—viz.: tup-lamb bred and fed by exhibitor, £3, £2, and £1; for five shearling tups, bred and fed by exhibitor, £4, £2, and £1; sheep, male or female, carrying the fleece best adapted for protecting the animal in a high, exposed, and stormy climate, £2, £1, and 10s. The animals competing for above prizes to be drafted from the regular classes.

#### PROPOSED BY-LAW.

The following by-law was substituted for by-law No. 5: The Society shall annually, at the General Meeting in January, choose out of the ordinary members a Board of thirty-two Directors, one-half of whom shall, at the date of their being so elected, be tenant-farmers or others who, if they were then to be elected members of the Society, would fall within the description of those who would have to pay the lower subscription under the terms of the second by-law. At the same meeting the Society shall also choose twenty Extraordinary Directors, ten of whom shall be resident in the district in which the Show of the year is to be held; the other ten shall be elected because of their known interest in and experience of the business of the Society, and of these five shall, when so elected, be either tenant-farmers or others who, if they were to be elected members of the Society at the date when selected, would come within the description of those persons who are entitled to become ordinary members of the Society under the second by-law.

MEETING OF DIRECTORS, 3D JUNE 1891.

*Present.*—*Ordinary Directors*—Mr John Lorne Stewart of Coll; Sir James H. Gibson-Craig, Bart.; Rev. John Gillespie, Mouswald Manse; Mr Macduff of Bonhard; Mr Ford, Fentonbarns; Mr Lumsden of Balmedie; Mr Forbes of Culloden; Mr Shirra Gibb, Boon; Mr Fisher, Jellyholm; Mr Wardlaw Ramsay of Whitehill; Mr Lockhart, Mains of Airies; Mr Cran, Kirkton; the Hon. the Master of Polwarth; Mr Gordon of Newton; Mr Aitken, Norwood; Mr Ferguson, Pictstonhill; Mr Elliot, Hollybush. *Extraordinary Directors*—Provost Yellowlees, Stirling; Mr Mitchell, Alloa; Mr Craig, Innergeldie; Sir Robert Menzies, Bart.; Mr Walker, Portlethen; Mr Elliot, Blackhaugh; Captain Clayhills Henderson of Invergowie, R.N.; Mr Buttar, Corston; Mr Murdoch, Garterraig; Mr Howatson of Glenbuck. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr Wm. Home Cook, C.A. *Engineer*—Mr Jas. D. Park. *Chairman of Machinery Committee*—Mr Middleton, Clay of Allan. Mr Lorne Stewart of Coll in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Hon. R. Baillie Hamilton; Sir Allan R. Mackenzie, Bart.; Mr Gilmour of Montrave; Mr Ballingall, Dunbog; Mr Kerr, Broomhouse; Mr McGibbon, Ardnacraig; Mr Mackenzie, Dalmore; Mr M'Queen of Crofts; Mr Martin of Auchendennan; Mr Maxwell, yr. of Munches; Mr Stirling of Kippendavie; and Mr Wilken, Waterside of Forbes.

THE LATE MR HEW CRICHTON, S.S.C.

Before proceeding to the business on the programme, the Directors resolved to record in the minutes an expression of the sincere regret with which they have received the intimation of the death of Mr Hew Crichton, S.S.C., and their sense of the assistance rendered by him as a member of the Society for fifty-three years, as a Director during the years 1868 to 1871, and as a member of the Finance and other Committees from 1868 to 1885.

MOVEMENT OF CATTLE.

The SECRETARY reported having sent excerpt of minute to the Board of Agriculture, calling attention to the allegation that cattle from several herds in England, after having been exhibited at the Royal Dublin Society's Show, held within, or in close proximity to, a district of Dublin scheduled under the Pleuro-pneumonia Order, had been permitted to be brought back to England; that receipt of the excerpt had been acknowledged, but that no answer had been given as to what steps the Board of Agriculture proposed to take. The Secretary was instructed to write again to the Board of Agriculture, drawing attention to the great importance of the subject, and begging that the Board would lose no time in investigating the matter.

IMPERIAL INSTITUTE.

A letter was read from Sir Frederick Abel, sending constitution of the permanent governing body, as approved by her Majesty's Royal Warrant on 21st April last, and requesting to know who the Society proposed to appoint as their representative. The Board unanimously selected the Duke of Montrose, President of the Society.

STIRLING SHOW.

On the motion of Mr FORBES of Culloden, it was resolved, after considerable discussion, to have a working dairy at the Stirling Show, the management being undertaken by a Committee of the Directors. In the course of the discussion, it was reported that the cost of conducting a working dairy in demonstrations in cheese and butter making cost the Society from £90 to £120. The plan of the showyard was reported to have been approved by the Stewards, and the situation of the aparian exhibition was arranged. The last days of entry for stock, poultry, and dairy produce was reported to be 22d June.

OVER-FEEDING OF STOCK FOR SHOWS.

On the motion of Mr FERGUSON, Pictstonhill, a Committee was named to consider what steps could be taken for the prevention of over-feeding animals for exhibition.

POTATO CROPS.

At the request of the Board of Agriculture, the Society undertook to conduct and report on certain specific experiments on disease of potato crops in Scotland, and a Committee was appointed for the purpose.

## GRANTS IN AID OF AGRICULTURAL EXPERIMENTS.

It was resolved to apply to the Board of Agriculture for a grant as above, and a Committee was appointed, along with the Secretary, to draw up the necessary form of application.

## BY-LAWS.

Proposed alteration on No. 5 was submitted, in terms of the charter.

## GENERAL MEETING.

The programme of business for the General Meeting was arranged.

## IRISH RAM-BREEDING SOCIETY.

A letter was read from the secretary, Mr Gavin Low, drawing attention to the regulation of their Society, "that secretaries of Agricultural Societies be addressed, pointing out that it is most desirable to prohibit the present practice of colouring and otherwise tampering with wool and the natural appearance of sheep exhibited, and that the date of shearing be given in the catalogues." The Directors did not see their way to interfere with the matter at present.

## MEETING OF DIRECTORS, 4TH NOVEMBER 1891.

*Present.—Ordinary Directors*—Mr Elliot of Wolfelee; Sir Jas. H. Gibson-Craig of Riccarton, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Macduff of Bonhard; Mr Ballingall, Dunbog; Mr Forbes of Culloden; Mr Shirra Gibb, Boon; Mr Gilmour of Montrave; Mr Fisher, Jellyholm; Mr Wardlaw Ramsay of Whitehill; Mr Lockhart, Mains of Airies; Mr Cran, Kirkton; Mr Glendinning, Hatton Mains; Mr Gordon of Newton; Mr Aitken, Norwood; Mr Ferguson, Pict-stonhill; and Mr M'Gibbon, Ardnacraig. *Extraordinary Directors*—Mr Martin of Auchendennan; Sir Robert Menzies of Menzies, Bart.; Sir Allan R. Mackenzie of Glenmuick, Bart.; Mr Kerr, Broomhouse; Captain Clayhills Henderson of Invergowrie, R.N.; Mr Buttar, Corston; Mr Murdoch, Garteraig; and Mr Howatson of Glenbuck. *Chemist*—Dr Aitken. *Auditor*—Mr W. Home Cook, C.A. *Engineer*—Mr J. D. Park. Mr Marr in the chair.

Mr F. N. MENZIES reported apologies for the absence of Sir G. Graham Montgomery, Bart.; Sir William S. Walker, K.C.B.; Mr Elliot, Hollybush; Mr Ford, Fentonbarns; Mr Macpherson Grant of Drumduan; Mr Lumsden of Balmedie; Mr M'Queen of Crofts; Mr Stirling of Kippendavie; Mr Walker, Portlethen; Mr Wilken, Waterside of Forbes.

## DECEASED MEMBERS.

Before proceeding to the business on the programme, the following resolutions were adopted:—

1. The Directors resolved to enter in the minutes an expression of the deep and sincere regret with which they have received the intimation of the death of the Right Hon. John Inglis of Glencorse, Lord Justice-General, and their sense of the services rendered by him as a member of the Society for thirty-nine years, and as Vice-President of the Society's Council on Education during the years 1867 to 1891.

2. The death of the Hon. Robert Baillie Hamilton of Langton having been communicated to the Society, the Directors resolved to record in their minutes an expression of the high respect in which he was held by them, and their sense of the assistance afforded by him during the years 1886-91 as an Ordinary Director and Vice-President of the Society.

3. The Directors resolved to record in their minutes the deep regret with which they regard the death of Mr Charles Stirling Home Drummond Moray of Blairdrummond, and their sense of the assistance which the Society had for thirty-nine years received from him as a member, Extraordinary Director, and Vice-President.

## BURSARY EXAMINATIONS.

The following gentlemen have passed examinations for the Society's £20 bursaries—viz.: Robert Affleck, junior, Rockstone Place, Castle-Douglas; Messrs C. Wood, Mid-house, Ervie, Kirkwall; John W. Forbes, 14 Parkview Terrace, Forfar Road, Dundee; James Wilson, West Mains, Dolphinton.

STIRLING SHOW.

The list of awards was submitted, and the Secretary was instructed to issue the premiums as soon as convenient.

TRANSFERENCE OF MEMBERS' TICKETS.

The list of those members who transferred their tickets at Stirling Show was submitted, and it was remitted to a Committee to advise as to what steps should be taken to put a stop to the practice.

INVERNESS SHOW, 1892.

The prize-list prepared by the General Show Committee was submitted, but approval was postponed till next meeting. A motion by Mr GILLESPIE to have a class for hackneys was favourably received, but it was thought advisable to leave it over till 1893, when the Show will likely be at Edinburgh. A Committee was appointed to examine and report on the expenditure in connection with the Society's Shows. Some cups and special prizes were reported, and it was remitted to a Committee to report upon the conditions under which they were offered. A sum of £25 for premiums to hunter brood-mares in foal or with foal at foot by a thoroughbred stallion was offered by Mr Gilmour of Montrave, and cordially accepted. It was resolved to hold next year's Show at Inverness, on the 26th, 27th, 28th, and 29th July.

MACHINERY.

The Directors approved of a suggestion by the Machinery Committee that a small Committee, along with the Stewards of Implements, be appointed to inspect the exhibition in the yard, and if anything new is found which they deem worthy of trial that it be reported to the Directors.

FORESTRY AND HIGHLAND INDUSTRIES.

It was resolved to give the same sum—viz., £50—in prizes for Highland Industries and Fisheries, and as suggested by the Committee, it was resolved to invite three members of the Senatus and two members of the Aborigines Society to confer with the Committee on the question of the endowment of the Chair of Forestry.

PUBLICATIONS.

Readers were appointed to report on the essays sent in for competition.

NOMINATION OF DIRECTORS.

A Committee was appointed to prepare a list of Extraordinary Directors, and to report to a future meeting.

MEETING OF DIRECTORS, 2d DECEMBER 1891.

*Present.—Ordinary Directors*—Mr Muckenzie, Dalmore; Sir Jas. H. Gibson-Craig, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Mr Macduff of Bonhard; Mr Ballingall, Dunbog; Mr Ford, Fentonbarns; Mr Lumsden of Balmedie; Mr Shirra Gibb, Boon; Mr Gilmour of Montrave; Mr Fisher, Jellyholm; Mr Lockhart, Mains of Airies; Mr Cran, Kirkton; Mr Stirling of Kippendavie; Mr Glendinning, Hatton Mains; Mr Gordon of Newton; Mr Aitken, Norwood; Mr Ferguson, Pictstonhill; Mr M'Gibbon, Ardnacraig; and Mr Elliot, Hollybush. *Extraordinary Directors*—Sir Robert Menzies, Bart.; Mr M'Queen of Crofts; Captain Clayhills Henderson of Invergowie, R.N.; Mr Buttar, Corston. *Hon. Secretary*—Sir G. Graham Montgomery, Bart. *Chemist*—Dr A. P. Aitken. *Engineer*—Mr J. D. Park. *Chairman of Machinery Committee*—Mr Middleton, Clay of Allan. Sir James H. Gibson-Craig, and afterwards Mr Marr, in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Master of Polwarth; Sir Wm. S. Walker, K.C.B.; Mr Wm. Home Cook, C.A.; Mr Elliot of Wolfelee; Mr Forbes of Culloden; Mr Howatson of Glenbrook; Mr Martin of Auchendennan; Mr Murdoch of Gartcairn; and Mr Wardlaw Ramsay of Whitehill.

## DEATH OF MR MUNRO OF KINLOSS.

Before proceeding to the business on the programme, the Directors resolved to record in the minutes the deep regret with which they regard the death of Mr John Munro of Kinloss, and their sense of the assistance which the Society had for thirty-nine years received from him as a member, a Director, and member of the Council, and Examiner on Agricultural Education.

## THE LATE HON. ROBERT BAILLIE HAMILTON AND MR CHARLES STIRLING HOME DRUMMOND MORAY.

Letters were read from the Hon. Mrs Baillie Hamilton, and Colonel Home Drummond of Blairdrummond, thanking the Society for the excerpt from their minutes expressing condolence.

## GENERAL MEETING.

The half-yearly General Meeting of the Society was fixed to take place on Wednesday, 20th January, at one o'clock.

## OFFICE-BEARERS AND DIRECTORS FOR 1892.

Office-bearers and Directors were nominated to fill vacancies, and their names will be published on their acceptance being received.

## SHOWYARD EXPENDITURE.

A report by a Special Committee was considered and approved of generally, some special matters being recommitted to the same Committee.

## PLEURO-PNEUMONIA.

Mr GORDON of Newton moved the following resolution: "That the Directors of the Society have heard with alarm of the spread of pleuro-pneumonia in Ireland, outside the Dublin Unions, and taking into consideration the large number of animals that are introduced into Great Britain from Ireland, desire, with all respect, to call the attention of the Board of Agriculture to the necessity of steps being taken to induce the Government to take all possible precautions against the shipment of cattle from scheduled or suspected districts or ports in Ireland to the ports of England and Scotland." He said that his reason for bringing forward the motion was that he had been informed by an inspector that pleuro was spreading in Ireland. The inspector was in Aberdeen, and it was evident that the disease had spread beyond the two Dublin Unions, and that there was no guarantee it would not spread further. They knew how cattle were used in coming to Great Britain from Ireland, and he suggested that the Board of Agriculture should be requested to take every action possible to prevent infected cattle leaving that country. Inspection was of very little value in Ireland, and the point at which the introduction of the disease could be prevented was the port of embarkation. He impressed upon the Directors the necessity of adopting his motion, and it was unanimously agreed to.

## SCOTTISH REPRESENTATIVE AND BOARD OF AGRICULTURE.

The Rev. JOHN GILLESPIE moved—"That it being understood that a vacancy was about to occur in the Board of Agriculture by the retirement of Sir James Caird, the Directors resolve to make a representation to the Government that they should appoint a gentleman from Scotland to supply the vacancy, and that a copy of this resolution be forwarded to the Prime Minister, the President of the Board of Agriculture, and the Secretary for Scotland; further, that the Secretary for Scotland be requested to receive a deputation from the Board on the matter." The motion was carried unanimously.

Mr GILLESPIE further moved—"That a circular be sent to Agricultural Societies and County Councils in Scotland, calling attention to the importance of having a representative from Scotland on the Board of Agriculture in place of Sir James Caird." This was also agreed to unanimously.

## INVERNESS SHOW.

The proof of the premium list and regulations which had been circulated was, after discussion, approved. An offer from Captain Clayhills Henderson, R.N., of £25 in premiums for yearlings the produce of the Queen's prize stallions, was accepted with best thanks.

CHEMICAL DEPARTMENT.

The lists of analyses sent by the Analytical Associations were submitted, and it was remitted to Dr Aitken to make inquiry regarding some of them that were deficient of the guarantee.

DAIRY DEPARTMENT.

The Committee recommended that the £100 grant should be divided as follows : £60 to the Kilmarnock Dairy School ; £20 to the Aberdeen Dairy Association of the Royal Northern Society ; and £20 to the Angus and Mearns Dairy School.

FORESTRY DEPARTMENT.

It was reported that a meeting had been held with the deputation of the Arboricultural Society, and that steps were being taken to raise funds and to carry on the lectureship in Forestry in Edinburgh University.

POTATO EXPERIMENTS.

It was reported that the report on potato experiments had been unavoidably delayed, and would be submitted to next meeting of Directors.

CORN SALES.

A letter was read from the Central Chamber of Agriculture sending copies of reports on corn sales.

AGRICULTURAL EXHIBITIONS.

A letter was submitted from the Department of Science and Art, London, stating that exhibitions would be held at Philippopolis in September 1892, and at Roustchuck in August 1893.

MEETING OF DIRECTORS, 6TH JANUARY 1892.

*Present.*—*Ordinary Directors*—Mr Mackenzie, Dalmore ; Sir Jas. H. Gibson-Craig of Riccarton, Bart. ; Rev. John Gillespie, Mouswald ; Mr Macduff of Bonhard ; Mr Ballingall, Dunbog ; Mr Ford, Fentonbarns ; Mr Lumsden of Balmedie ; Mr Shirra Gibb, Boon ; Mr Cran, Kirkton ; Mr Ferguson, Pictstonhill ; Mr M'Gibbon, Ardmacraig ; Mr Elliot, Hollybush. *Extraordinary Directors*—Ex-Provost Yellowlees, Stirling ; Mr Martin of Auchendennan ; Mr Buttar, Corston ; Mr Murdoch, Gartcraig. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr W. Home Cook, C.A. *Engineer*—Mr Jas. D. Park. Rev. John Gillespie in the chair.

Mr F. N. MENZIES reported apologies for the absence of Lord Elphinstone ; Sir G. Graham Montgomery, Bart. ; Sir W. S. Walker, K.C.B. ; Mr Aitken, Norwood ; Mr Elliot of Wolfelee ; Mr Fisher, Jellyholm ; Mr Glendinning, Hatton Mains ; Mr Gordon of Newton ; Captain Clayhills Henderson of Invergowie, R.N. ; Mr Howatson of Glenbuck ; Mr Kerr, Broomhouse ; Mr Lockhart, Mains of Airies ; Mr M'Queen of Crofts ; Mr Maxwell, yr. of Munches ; Mr Middleton, Clay of Allan ; Mr Wardlaw Ramsay of Whitehill ; Mr Stirling of Kippendavie ; Mr John Lorne Stewart of Coll ; and Mr Wilken, Waterside of Forbes.

THE LATE MR MUNRO OF KINLOSS.

A letter was read from Mrs Munro of Kinloss thanking the Directors for their expression of sympathy on the loss of her husband.

OFFICE-BEARERS AND DIRECTORS FOR 1892.

The office-bearers, as suggested by the Committee, and published in the newspapers, to fill the vacancies on the Board, were approved of.

## RESIGNATION OF MR DUNCAN.

The following letter was read to the Board:—

“DEAR SIR,—In consequence of the state of my health and advancing years, I beg respectfully to resign the appointment I have the honour to hold as Clerk to the Highland and Agricultural Society, an office I have endeavoured to discharge to the best of my ability since 22d March 1841, a period of nearly fifty-one years. I cannot contemplate the severance of my long official connection with the Society without great regret. At the same time, I shall be able to look back with pleasure on the cordiality and good feeling which have ever subsisted between myself and the various officials of the Society under whom I have served, and also the kindness and consideration I have received at your hands. I should like my resignation to take place in April. Please communicate this letter to the Directors.—I am, yours respectfully,  
“THOMAS DUNCAN.

“F. N. Menzies, Esq.”

The CHAIRMAN said he was quite sure that every member of the Board, whether present or absent, would receive this intimation from Mr Duncan with profound regret, and that this feeling would be shared by all who had had the privilege to occupy a seat at the Board. In fact, all who had anything to do with the business of the Board could not but have feelings of gratitude to Mr Duncan for his long and faithful service to the Society. He feared there was nothing for them to do but to accept the resignation, and take the necessary steps for filling up the vacancy. From what Mr Menzies had told him, he was afraid there was no use asking Mr Duncan to continue in office. But he was sure it would be the desire of the Board to place on record a proper expression of their sense of the long and extremely valuable services which the Society had got from Mr Duncan. He suggested that a Committee should be appointed to deal with the whole matter, and report to the Board. There might be various matters which would require to be dealt with in this connection—matters relating to Mr Duncan as well as the future arrangements.

The suggestion was agreed to, and the following Committee was appointed: Sir James H. Gibson-Craig, *Convener*; Rev. John Gillespie, Mr Macduff of Bonhard, Mr Gordon of Newton, Mr Middleton, Clay of Allan, Mr Martin of Auchendennan, and Mr Elliot, Hollybush.

## PLEURO-PNEUMONIA.

The following letter from the Board of Agriculture was read:—

“7th December 1891.

“SIR,—With reference to your letter of 3d inst., forwarding excerpt from the minutes of Directors of the Highland and Agricultural Society on the subject of the importation into Great Britain of cattle from Ireland, I am directed to inform you that the Board of Agriculture have already communicated with the Irish Government on the matter.—I am, sir,

RICHARD DAWSON.”

Resolutions passed at the public meeting held in Edinburgh on 11th November were submitted, and consideration delayed till next meeting.

## SCOTTISH REPRESENTATIVE ON BOARD OF AGRICULTURE.

Letters were read from the Secretary to the Marquis of Salisbury, stating that the Society's letter on this subject had been referred to the First Lord of the Treasury, in whose gift the appointment rests; from the Secretary to the Marquis of Lothian, stating that he could not properly receive a deputation on a subject regarding the constitution of the Board of Agriculture; and also from the Board of Agriculture, stating that the appointment had already been made. The Chairman moved—“That, while expressing disappointment with the replies received, the Society adheres to its original action, and hereby resolves to press their view upon the Government and the members of Parliament for Scotland; and that it be remitted to a Committee to prepare a statement of the case for this purpose, and generally to take the necessary steps to carry out the resolution.” The motion was seconded by Mr FERGUSON, and after some discussion, it was moved by Mr LUMSDEN, and seconded by Sir ROBERT MENZIES—“That the Society take no further steps in the matter.” On a vote being taken, the amendment was carried by a majority.

## FINANCE.

The accounts for 1890-91 as prepared by the Auditor, and approved by the Finance Committee, were laid on the table.

MELROSE SHOW, 1889.

The Secretary reported that he had received £53, 14s. 4d., being the balance of subscriptions collected in aid of the Show.

INVERNESS SHOW.

Letters were read from the Clydesdale Horse Society offering a champion premium of £10, 10s. for the best Clydesdale stallion; from Mr Macpherson Grant of Drumduan, offering two perpetual challenge cups, valued at £50 each, for annual competition at the Society's shows; from Mr Macpherson of Corrimony, offering a silver champion cup, valued at £50, under special conditions; from Mr Forbes of Culloden, intimating £25 premium; from Mr Shoolbred of Wyvis, for a family group of Highland cattle; a prize of £10, 10s. by Mrs Morison Duncan of Haughton, for the best cow of the Aberdeen-Angus breed; and of £10, 10s. by the Highland Cattle Society, for the best Highland bull; and from Mr George Bruce, Aberdeen, offering three prizes for Shetland ponies. All these prizes were accepted with thanks.

HIGHLAND INDUSTRIES.

Prize-list, as prepared by Committee, was approved.

AGRICULTURAL AND FORESTRY EDUCATION.

The examinations were fixed for 23d, 24th, and 25th March.

POTATO EXPERIMENTS.

A report by Dr Aitken on experiments undertaken at the request of the Board of Agriculture with Bordeaux spray as a preventive of potato disease was laid on the table, and copies may be obtained from the Secretary.

GENERAL MEETING.

The programme of business of the General Meeting on 20th January was arranged.

NEW MEMBERS.

The Secretary reminded the Directors that he could receive the names of new members up to the morning of 20th January.

MEETING OF DIRECTORS, 20th JANUARY 1892.

*Present.—Ordinary Directors*—Mr Elliot of Wolfelee; Sir Jas. H. Gibson-Craig of Riccarton, Bart.; Rev. John Gillespie, Mouswald Manse; Mr Macduff of Bonhard; Mr Ford, Fentonbarus; Mr Shirra Gibb, Boon; Mr Stirling of Kippendavie; Mr Glendinning, Hatton Mains; Mr Ferguson, Pictouhill; Mr Elliot, Hollybush. *Extraordinary Directors*—Mr Martin of Auchendennan; Sir Robert Menzies of Menzies, Bart.; Mr Elliot, Blackhaugh; Captain Clayhills Henderson of Invergowie, R.N.; Mr Buttar, Corston. *Chemist*—Dr A. P. Aitken. *Auditor*—W. Home Cook, C.A. *Engineer*—Mr Jas. D. Park. Sir Jas. H. Gibson-Craig in the chair.

Mr F. N. MENZIES reported apologies for the absence of the Duke of Montrose; Sir Geo. Macpherson Grant, Bart.; Sir Allan Mackenzie, Bart.; Sir G. Graham Montgomery, Bart.; Mr Aitken, Norwood; Mr Cran, Kirkton; Mr Fisher, Jellyholm; Mr Forbes of Culloden; Mr Gilmour of Montrave; Mr Gordon of Newton; Mr Kerr, Broomhouse; Mr Lockhart, Mains of Airies; Mr Lumsden of Balmedie; Mr M'Gibbon, Campbeltown; Mr M'Queen of Crofts; Mr Middleton, Clay of Allan; and Mr Murdoch, Gartcaigh.

DEATH OF MR JOHN MACGREGOR, LADYWELL.

Before proceeding to the business on the programme, the Directors resolved to record in the minutes an expression of the deep regret with which they regard the death of Mr John Macgregor, Ladywell, and their sense of the assistance which the Society had for thirty years received from him as a member and an examiner on the Science of Forestry and Practical Management of Woods.



## PLEURO-PNEUMONIA.

The CHAIRMAN stated that there was nothing more to report since last meeting with reference to pleuro-pneumonia.

## TREATMENT OF PLEURO-PNEUMONIA.

A letter was read from Mr M'Dougall, Southport (the inventor of M'Dougall's Dip), with reference to the treatment and cure of pleuro-pneumonia by fumigation of the byres with gas generated from sulphur dioxide. A letter was also read from Dr Littlejohn, Edinburgh, in support of Mr M'Dougall's treatment. After considerable discussion the Board resolved to remit the matter to the Veterinary Committee of the Society to report.

## GENERAL MEETING.

The Board considered the propriety of holding the General Meeting of the Society under the sad circumstance of its being the Duke of Clarence's funeral-day, and it was unanimously agreed that the only business to be brought before the meeting should be the passing of votes of condolence (which appear in the report of said meeting) and the appointment of the new office-bearers of the Society, who, according to the charter, required to be elected at this meeting.

## PLAGUE OF FIELD-MICE OR VOLES.

The Rev. JOHN GILLESPIE called attention to the damage that was being done to the pastures in the south of Scotland by field-mice or voles, and moved the following resolution: "That the Board of Agriculture be requested to take steps to carry out an investigation into the circumstances and causes of the plague, with the view of ascertaining what prevention should be employed; and further, that the Directors offer to give the Board any assistance in their power."

## MEETING OF DIRECTORS, 3D FEBRUARY 1892.

*Present.*—*Vice-President*—Mr Martin of Auchendennan. *Ordinary Directors*—Mr Ballingall, Dunbog; Mr Ford, Fentonbarns; Mr Maxwell, yr. of Munches; Mr Shirra Gibb, Boon; Mr Gilmour of Montrave; Mr Fisher, Jellyholm; Mr Lockhart, Mains of Airies; Mr Cran, Kirkton; the Hon. the Master of Polwarth; Mr Stirling of Kippendavie; Mr Gordon of Newton; Mr Ferguson, Pictstonhill; Mr Elliot, Hollybush; Mr Sinclair Scott, Craigievar; Sir Robert Menzies of Menzies, Bart.; Mr Paterson, Hill of Drip; Sir James H. Gibson-Craig of Riccarton, Bart.; Mr Marr, Cairnbrogie; Rev. John Gillespie, Mouswald Manse; Mr Elliot of Wolfelee. *Extraordinary Directors*—Mr Fletcher of Rosehaugh; Mr Miller of Scrabster; Sir Allan R. Mackenzie of Glenmuick, Bart.; Mr M'Queen of Crofts; Captain Clayhills Henderson of Invergowie, R.N.; Mr Buttar, Corston; Mr Murdoch, Gartcraig; Mr Mackenzie, Dalmore; Mr Macduff of Bonhard. *Honorary Secretary*—Sir G. Graham Montgomery of Stanhope, Bart. *Chemist*—Dr A. P. Aitken. *Auditor*—Mr W. Home Cook, C.A. *Engineer*—Mr James D. Park.

Mr F. N. MENZIES reported apologies for the absence of Sir George Macpherson Grant, Bart.; Sir Kenneth S. Mackenzie, Bart.; Mr Aitken, Norwood; Mr Forbes of Culloiden; Mr Howatson of Glenbuck; Major Randle Jackson of Swordale; Mr Kerr, Broomhouse; Mr Lumsden of Balmedie; Mr M'Gibbon, Ardnacraig; Mr M'Lean, Dunrobin; Mr Middleton, Clay of Allan; Mr Wilken, Waterside of Forbes; Major Rose of Kilravock.

## THE LATE DUKE OF CLARENCE AND AVONDALE.

A letter was received from the Secretary of Scotland acknowledging receipt of vote of condolence to her Majesty the Queen, and stating that his Lordship would take an early opportunity of laying the address before her Majesty.

The following letter from the Princess Victoria Mary of Teck was read:—

"WHITE LODGE, RICHMOND PARK,  
30th January 1892.

"To the Chairman of the Highland and Agricultural Society.

"SIR,—I beg to thank you and the members of the Highland and Agricultural Society of Scotland for the address of sympathy and condolence with me in my great

grief which you have forwarded to me. The kind wording of the address, especially that portion of it which refers to the charming disposition of the Duke of Clarence, has greatly touched me, and will ever be gratefully remembered by me.—I am, sir, yours faithfully,  
VICTORIA MARY OF TECK."

THE LATE MR JOHN MACGREGOR.

A letter was read acknowledging resolution on the death of Mr John Macgregor.

PLAGUE OF FIELD-MICE OR VOLES.

The following letter from the Secretary of the Board of Agriculture was read:—

"LONDON, *January 23, 1892.*

"SIR,—I am directed to acknowledge receipt of your letter of 20th inst., enclosing resolutions on the plague of field-mice or voles in the pastoral districts of the southern counties of Scotland.

"I am to state, for the information of your Society, that the attention of this Board has been already directed to the damage reported to be inflicted, and steps are being taken, by special inquiry, to obtain information as to the circumstances. I take note of offer of assistance tendered on behalf of the Directors of your Society, for which the Board are much obliged, and I should be glad to receive from you, as soon as may be practicable, a detailed statement of the particular districts which are believed by your Society to have suffered most severely on this occasion, together with any information obtained in the manner indicated in your letter, or available from the records of your Society, as regards former attacks of like nature to the present.

"T. H. ELLIOTT, *Secretary.*"

The SECRETARY stated that he had received a large amount of information in regard to the ravages of these voles, and that he still expected to get some more. He was getting it printed, and as soon as possible he would send copies to the Board of Agriculture.

PLEURO-PNEUMONIA.

The minute of Committee appointed to meet Mr M'Dougall with reference to his cure of pleuro by the use of sulphur dioxide was laid before the Board. The minute explained that they had met Mr M'Dougall, and he had related his experiments with sulphur dioxide, more especially at the London Veterinary College, under the authority of the Board of Agriculture, but that he had been compelled to cease conducting these experiments owing to the opposition of an official of the Board, and he requested the Highland Society to take the matter up and conduct the experiments for him. The Committee hardly felt justified in recommending the Board to comply with this request, as they consider that if such trials are to be exhaustively carried out, they should be conducted by the Board of Agriculture at the public expense. They consider Mr M'Dougall is entitled to great credit for his method of applying and controlling the treatment of pleuro by sulphur dioxide, but in the face of the consensus of veterinary opinion that when once the disease of pleuro has obtained a footing in the lungs of an animal, and that lung has become indurated, it never can thoroughly recover. The sulphur dioxide may probably be beneficial as a disinfectant or preventive before the disease is actually established, and its cheapness is in its favour.

The Directors approved of the Committee's report.

STANDING COMMITTEES.

The list was revised, and some new members added.

NEW MEMBERS.

The list of candidates for election was submitted and approved.

GENERAL MEETING.

The programme of business was arranged.

GLANDERS.

A letter was read from Mr Hunting, V.S., London, as to stamping out glanders, which was referred to the Veterinary Committee.

## PROCEEDINGS AT GENERAL MEETINGS.

---

GENERAL MEETING, 17TH JUNE 1891.

Sir JAMES H. GIBSON-CRAIG, Bart., in the Chair.

### NEW MEMBERS.

Sixty-two new members were balloted for and admitted.

### FREE LIFE MEMBERS.

Ten holders of the Society's Diploma in Agriculture were elected free life members in terms of the by-laws.

### STIRLING SHOW, 1891.

Mr STIRLING of Kippendavie reported that the dates of the Stirling Show were 28th, 29th, 30th, and 31st July. The entries for implements and other articles closed last month. Stock, poultry, and dairy produce will be received up to the 22d June, but no entry can be taken later than by first post on Monday morning, 22d June. Post entries for stock only taken at double fees till Wednesday morning, 24th June, at ten o'clock. Owing to the change from the Commissioners of Supply to the County Councils, it was on this occasion remitted to the members of the Board in the Stirling district, and the conveners of the Committees appointed to collect subscriptions in aid of the Show, to nominate a local Committee of Superintendence. The members met at Stirling on the 24th of April, when the following were selected: *Stirlingshire*—Sir Allan H. Seton Steuart of Touch, Bart.; Mr Edwin Bolton, West Plean; Mr Buchanan, Whitehouse; Mr Edmond, Gallamuir; Mr Fleming, Carmuir; Mr King, Antermoney House; Mr M'Laren, Cornton; Mr Malcolm, Dunmore; Mr Graham Moir of Leckie; Mr Paterson, Hill of Drip; Mr Reid, Haining Valley; Colonel Stirling of Gargunnoch; Mr Stirling of Tarduff. *Dumbartonshire*—Mr Duncan, Auchinbee; Mr Kennedy, Chesters; Mr Lumsden of Arden; Mr Mackinlay, Ardoch; Mr M'Lean, banker, Alexandria; Mr Murray, Catter House; Mr Whitelaw of Gartshore; Mr Burt Wright of Auchinvole. *Western District of Perthshire*—Mr Anderson, Kippenross Estate Office, Dunblane; Mr Ballingall, factor, Blair Drummond; Mr Carrick, Baad; Mr Fletcher, Auchtertyre; Mr M'Caull, Knockhill; Mr M'Lachlan, Doune Lodge; Mr Morris-Stirling, Gogar House; Mr Young, Keir Mains. *Clackmannanshire*—The Earl of Mar and Kellie; Mr Drysdale, King o' Muirs; Mr Fernie, Hilton; Provost Younger, Alloa. *Town of Stirling*—Baillie Kinross; Baillie Menzies; Baillie Forrest; Baillie Brown; Mr Millar, Dean of Guild; Mr Mercer, ex-Dean of Guild.

In addition to these there will be a large deputation of Directors. The Duke of Montrose is President of the Society, and Sir James R. G. Maitland of Barnton, Bart., is Convener of the Local Committee. The contracts are in the hands of the following parties: *Erection of showyard*—Mr James Farquhar, Broomhill Place, Aberdeen. *Supply of refreshments in the yard*—Mr Mitchell, 3 India Street, Edinburgh; Mr Brodie, Lothian Street, Edinburgh; Messrs Wilson, Perth and Glasgow; Mr White, 7 Gordon Street, Glasgow. *Supply of forage*—Mr Dewar, King's Park, Stirling. In regard to the supply of forage given to exhibitors' stock during the week of the Show, I may mention that it was some time since remitted to a Special Committee to consider the whole matter. After careful consideration, the

Committee recommended that there should be no change as to the quantities in anything except green food, and that in it the quantity should be unrestricted, but that the stewards should be instructed to see that there is no waste, and that it be inserted in the forage-cards that if waste prevails the privilege will be cancelled. The following members have been nominated as showyard stewards: Sir Allan R. Mackenzie, Bart., for horses; Rev. John Gillespie for cattle; Mr Elliot, Hollybush, or sheep, swine, &c.; Mr Buttar, Corston, for forage; Mr Middleton, Clay of Allan, and Mr Kerr, Broonhouse, for implements. Tickets for the Show will be sent in the course of next month to all members residing in the United Kingdom whose addresses are known. A second edition of the premium list was some time ago printed containing several additional special prizes, copies of which may be had on application to the Secretary. During the Show the headquarters of the Society will, as usual, be at the Golden Lion Hotel, Stirling.

Colonel STIRLING stated that the change from Commissioners of Supply to County Councils had been attended with great advantage, so far as support to the Society was concerned, for they had this year raised more money by subscriptions from the western district of Perthshire than they had ever got for the Highland Society's Shows from the Commissioners of Supply.

#### CATTLE EXHIBITED AT DUBLIN SHOW.

Mr GORDON of Newton, Aberdeenshire, said he wished to draw the attention of the meeting to a matter connected with the exhibition of cattle from Great Britain at the recent show of the Royal Irish Society in Dublin. At a recent meeting of the Directors, Mr Gillespie, who was always on the alert for anything affecting the interests of the Society, referred to the fact that forty-six animals had been sent over to Ireland, and had been exhibited in a scheduled district. The Irish Privy Council did not seem to come under the influence of the Board of Agriculture, for fifteen of these animals had returned to England, and had since been exhibited without let or hindrance. It appeared to Mr Gillespie and himself that it was exceedingly hard that these breeders, having chosen to thrust their animals into a scheduled district, should be allowed to exhibit them all over Britain, while farmers in some districts of Scotland were rigorously prevented from moving a single beast from one grass-field to another, even though it was starving. The Directors had made a representation to the Board of Agriculture on 6th May, but up to the 27th May no answer had been received, except the formal acknowledgment of the receipt of the communication. The Secretary of the Society had again written to the Board of Agriculture, and also to the Council of the Royal Agricultural Society of England, and they would have seen in the newspapers the steps which the Royal Society had taken to exclude these cattle from the Doncaster Show. On 3d June the Directors passed a resolution to exclude these cattle from the Stirling Show, and he thought that resolution would commend itself to the approval of most of those present. Since then a telegram had come from the Board of Agriculture, pleading that the Board had no authority over the Irish Privy Council, and that they did not know the circumstances under which these cattle returned from Ireland after being shown at Dublin. The Board further admitted that since the Dublin Show a Jersey cow which was exhibited there, and was sold to a gentleman near Dublin, had died from contagious pleuro-pneumonia. The Directors had met that day to consider the matter, and had unanimously adopted the following resolution: "That the resolution adopted at the meeting of Directors on 3d inst. be extended so as to exclude all animals from the herds of those owners who exhibited cattle at the recent show of the Royal Dublin Society at Ballsbridge; and that a copy of the resolution be sent to the Secretary of the Royal Agricultural Society of England, along with an extract from a letter received by Mr Menzies from the Board of Agriculture giving the information received by the Board of Agriculture from the Irish Government with regard to the death of a cow exhibited at Dublin from pleuro-pneumonia."

The Rev. J. GILLESPIE, Monswald, said there was another phase of this matter. These cattle were shown within a scheduled district in Dublin, a thing that would not have been permitted on this side of the water, and fifteen of the cattle were allowed to come back. The Society were protecting exhibitors as far as Stirling Show was concerned, but how were they to protect the general herds of the country if such a state of things was to be allowed? Apparently the Irish Privy Council had it in their power at present to grant certificates to owners of cattle in Ireland, enabling them to send animals across to Britain. He thought the Society should follow up their resolution by remonstrating with the Board of Agriculture, and urging that something should be done to prohibit cattle that had been in a scheduled district in Ireland from being landed on this side of the Channel.

The action of the Directors was cordially approved of.

## THE SHOW OF 1892.

Colonel STIRLING reported that Mr Duncan Forbes of Culloden was taking steps to obtain subscriptions towards a fund with the view of inviting the Society to hold next year's Show at Inverness, and the result would be intimated to the General Meeting to be held at Stirling.

## ALTERATIONS ON BY-LAWS.

The CHAIRMAN submitted for confirmation certain additions to by-laws Nos. 1 and 3 made at last General Meeting, and these were agreed to. He also submitted the following by-law, which was proposed to be substituted for No. 5: "The Society shall annually at the General Meeting in January choose out of the ordinary members a Board of thirty-two Directors, one-half of whom shall, at the date of their being so elected, be tenant-farmers or others who, if they were then to be elected members of the Society, would fall within the description of those who would have to pay the lower subscription under the terms of the second by-law. At the same meeting the Society shall also choose twenty Extraordinary Directors, ten of whom shall be resident in the district in which the Show of the year is to be held; the other ten shall be selected because of their known interest in and experience of the business of the Society, and of these five shall, when so selected, be either tenant-farmers or others who, if they were to be elected members of the Society at the date when selected, would come within the description of those persons who are entitled to become ordinary members of the Society under the second by-law." The proposed alteration had, in accordance with the charter, been notified at two meetings of the Board of Directors (6th May and 3d June) previous to the present General Meeting. If it met the approval of the meeting it would be submitted to the next General Meeting for confirmation.

The additions to by-laws 1 and 2 were confirmed; and the alteration on by-law No. 5 was approved.

## PROPOSED CHAIR OF FORESTRY.

Sir ROBERT MENZIES made a verbal report on the progress of a movement to permanently establish a Chair of Forestry in this country. The Government had undertaken to supply half the sum necessary to endow such a chair, and an attempt had been made to raise £5000 in the country. It had not been so successful as he could have wished, but he regarded the prospects as not altogether hopeless. Fourteen hundred circulars had been sent out, and subscriptions to the extent of £269 had been received, making, with £1000 voted by the University of Edinburgh, nearly £1300. He did not think this matter should be looked on as a matter concerning landed proprietors alone, when they considered the great opening there was in India and South Africa.

Professor WALLACE stated that arrangements were being made for a successor to Dr Sommerville, the Edinburgh lecturer in Forestry.

Dr CLEGHORN said the subscriptions might not be coming in so rapidly as they might desire, but the amount was being added to daily, and there was no doubt of their ultimate success.

## GOVERNMENT GRANT FOR EXPERIMENTS.

The Rev. J. GILLESPIE reported that last year the Society had received £150 of a grant from the Board of Agriculture for agricultural experiments. This year they had applied for, and hoped to obtain, a larger sum, in consideration of the amount of work that was being overtaken by the Society in those departments of agriculture for which the grant was mainly intended.

## POTATO DISEASE EXPERIMENTS.

Mr GLENDINNING, Hatton Mains, reported that, at the request of the Board of Agriculture, arrangements had been made for carrying on experiments to ascertain the effects of the potato disease, and the best means of checking its ravages in three different districts of Scotland—East Lothian, Renfrewshire, and Forfarshire.

## DAIRY INSTRUCTION.

Mr M'QUEEN of Crofts stated that the Directors had agreed to have a working dairy at the Stirling Show, where instructions in cheese and butter making would be given. The Board of Agriculture were at present making arrangements for examinations in these branches, and a small Committee of the Society had been appointed to confer with the Board of Agriculture so that these examinations will be uniform throughout the country.

## TECHNICAL EDUCATION.

Rev. JOHN GILLESPIE gave in the report of a Committee on County Council grants. He stated that circulars had been sent to the secretaries of every agricultural society, to all school boards, and to all who were known to be engaged in teaching, calling attention to the existence of this money, which was expected to be devoted partly, if not entirely, to technical instruction, and asking each body in their respective spheres to take such action to utilise this money for the purposes intended as was thought advisable; and he would only express the hope that in the different districts everything would be done to set agricultural instruction on a more satisfactory basis. He agreed most heartily with those who held that agricultural education must be carried to the provinces. Agricultural education, he believed, would never be satisfactorily carried out in the country until they had practically the three grades they had in the general instruction of the country—elementary schools in the provinces, secondary schools in the bigger towns, and colleges in the large centres.

## REPORT OF CHEMIST.

Dr AITKEN said: I have to report that the investigation referred to by me at the last General Meeting, to determine the value of the Ayrshire cow as a milk-producer, and its utility for the purposes of cheese and butter production, is now in full operation in Ayrshire. An accurate record is being kept of the amount of milk yielded, morning and evening, by about one hundred cows on ten farms, and a sample of the milk of each cow is being sent to the laboratory once a fortnight for analysis. The experiment began at the beginning of May, and already upwards of three hundred samples of milk have been analysed. It was intended that the experiment should last for three months; but as the weather of May was so unpropitious, and the grass so late in coming, it has been resolved to continue it into the month of August. I expect by that time to have sufficient material at my command, not only to exhibit the milking qualities of the Ayrshire cow, but also to show how the quantity and quality of the milk are influenced by the character of the food consumed, and by other circumstances regarding which notes are being recorded by the experimenters.

But whatever the amount and value of the information so obtained may be, I shall regard them as a small thing in comparison with the main object already achieved, of introducing into the farms of some of the leading Ayrshire farmers the practice of keeping an accurate dairy record.

I am convinced that the keeping of such a record lies at the foundation of successful dairy-farming, and that however much we may desire to rival our competitors in dairy produce, and however much we may talk about it, we shall not succeed until the keeping of a dairy record has become general. It involves some trouble; but that is apt to be much exaggerated by those who have not tried it, and I am already assured by some of those now engaged in this experiment that the trouble which at first caused some anxiety is now regarded as nothing in comparison with the pleasure which it affords. It is investing their work with a new interest, and is pointing the way to improvements and means of profit that would otherwise have been disregarded.

During the last two years, while engaged in feeding experiments, I have been much struck with the great differences in the feeding value of the oat-straw, and also of the oats grown on different farms; and considering how important is the part taken by these two articles of food in this country—more important, perhaps, than in any other country—it has occurred to me that an investigation into the composition of the oat-straw and grain grown in different districts of Scotland, and in widely different circumstances, might be of great use. The fashion in oats has changed and fluctuated all over the country, and it would be hard to say on what grounds different varieties have come to the front, and after a certain period of favour have fallen into disrepute. There are many circumstances affecting the growth of the oat crop, and experience shows that certain varieties of seed are better adapted to some circumstances than others. Farmers may be trusted to know pretty well what they are about in preferring one variety to another. They come to know what suits their soil and climate, and what produces the largest yield; but it is very difficult for them to determine what is the relative feeding value of the different varieties of oat-straw and grain they grow. There is a wide field for investigation open in this direction, and it is one well worthy of the attention of the Chemical Department of the Society. As a beginning to the investigation, a circular was sent a few months ago to various agricultural societies over the country, asking that samples of the oats most in favour in each district might be sent to me, and I am glad to say that the request has met with a most liberal response. I am now in possession of about sixty samples of unthreshed oats, and all the information regarding them that was asked in the circular, and the investigation of the straw and grain of these samples, will occupy the whole of the coming winter.

The interesting experiments performed in the body of a feeding ox to determine the

The experiments at Pumphreston Station, to show the effects of different manures on the growth of grass recently sown out and laid down for permanent meadow, are now in their fourth year. Owing to the backward nature of the season, the manures were not applied this year until the 2d of May upon the early section, and a fortnight thereafter on the late section. The third section, which has hitherto been left unmanured, has this year received a dressing of nitrate of soda in order to bring to the surface the unexhausted residues of phosphates and potash salts applied in former years. Full details of the results of last year's crop are recorded in the 'Transactions.'

At this time last year I ventured to express the hope that the Government, through its Agricultural Department, would regard with favour the extensive and important work which the Society was carrying on for the advancement of agricultural education, by means of practical experiments, not only at its own stations, but in different parts of the country, and that it would give the Society a share of the grant at its disposal for that purpose. The Society made an application, which was responded to by a grant of £150. The Chemical Committee gratefully acknowledge the assistance they have received, which has enabled them to extend considerably the sphere of their operations, and they hope that the grant may not only be renewed, but increased in the coming year, in order to enable them still more effectively to come to the assistance of the associations throughout the country who, under the Society's direction, are endeavouring to advance their knowledge by means of carefully conducted field experiments.

#### BOTANICAL REPORT.

Professor M'ALPINE reported that during the early part of this season he had analysed 250 samples of clover and grass seeds, and, taken as a whole, the seeds compared somewhat unfavourably with those of last season. Leguminous seeds were much more sluggish in germination than usual. Last season, most clover seeds would be hatched in about a week; this year two or three, and in some cases more, were required. The grass seeds, as a whole, were much inferior in quality to last year, and this inferiority was quite striking in the case of ryegrass. The following table shows the maximum and minimum percentage of germination of the seeds tested this year :—

	Percentage of germination.	
	Maximum.	Minimum.
Red clover . . . . .	96	70
White clover . . . . .	95	65
Alsike clover . . . . .	97	75
Trefoil . . . . .	91	80
Foxtail . . . . .	80	45
Sweet vernal . . . . .	70	45
Golden oat . . . . .	67	50
Dogstail . . . . .	93	55
Cocksfoot . . . . .	98	47
Hard fescue . . . . .	95	62
Sheep's fescue . . . . .	84	60
Meadow fescue . . . . .	98	65
Tall fescue . . . . .	93	45
Italian . . . . .	97	60
Perennial . . . . .	97	43
<i>Poa pratensis</i> . . . . .	75	40
<i>Poa trivialis</i> . . . . .	98	55

#### AGRICULTURAL EDUCATION.

The Rev. JOHN GILLESPIE, Mouswald, reported that the annual examination of candidates for the Society's diploma and certificate in Agriculture was held on the 24th, 25th, and 26th March. The number of candidates who presented themselves was twenty-seven. The examination resulted in ten passing for the diploma, and twelve for the first-class certificate, viz.:—

*For diploma*—John Brown, Hillhead Farm, Airdrie; Robert James Irving, Blackhall House, Carlisle; Joseph Lister, Little Broughton, Carlisle; Duncan Munro, 3 Dalrymple Place, Edinburgh; John Murray, The Muir, Laurencekirk; Alexander Buchan Stevens, Mains of Kilgraston, Bridge of Earn; W. E. C. White, Elsham

Brigg, Lincolnshire; T. A. Coward, Eden Town, Carlisle; W. J. Fleet, Marchmont, Duns; A. C. Forbes, Farnham Royal, Slough, Bucks. *For first-class certificate*—Chas. Arnison, Ravenstone, Wordsworth Street, Penrith; R. G. Craske, 2 Beverley Road, Colchester; James S. Gordon, Stragollan House, Strablane, Ireland; R. B. Greig, Balcurvie, Windygates, Fife; William Hutchison, 10 Dudhope Place, Dundee; George T. Luxton, 136 London Road, Gloucester; James Mackinnell, Kilmartin, Lochgilphead; W. G. Mason, Marsh Grange, Kirkby-in-Furness, Carnforth; L. C. Seheult, Arima, Trinidad, British West Indies; M. H. Ward, Fernside, St Helens; James Weir, Woodilee, Lenzie; William Wilson, Goody Hills, Maryport.

At a meeting of the Board held in April last, the following resolution was unanimously adopted: "That as far as possible the teaching element should be eliminated from the Examining Board; but that, if teachers are appointed, the different agricultural schools should be represented by rotation or otherwise."

Mr GILLESPIE also announced that the £10 given in books to the class of Agriculture in the University of Edinburgh had this year been equally divided as follows: (1) R. B. Greig, Balcurvie, Windygates; (2) T. A. Coward, Eden Town, Carlisle; (3) James Mackinnell, Kilmartin, Lochgilphead.

Mr GILLESPIE further reported that the Master of Polwarth; Sir James H. Gibson-Craig, Bart.; Mr Wardlaw Ramsay of Whitehill; Mr Maxwell, yr. of Munches; Rev. John Gillespie; Mr Martin of Auchendennan; Mr Marr, Cairnbrogie, had been recommended as the members of the Council nominated by the Society.

The Report was approved.

#### FORESTRY DEPARTMENT.

Sir ROBERT MENZIES reported that the Forestry examinations were held on the same days as those under the Agricultural Educational Charter, when the following candidates passed: *For first-class certificate*—John C. Menzies, Bankhead, Duns. *For second-class certificate*—John A. Sawyer, Horningsham, Warminster, Wiltshire.

#### ABORTION OF COWS.

Mr WARDLAW RAMSAY stated that the Directors, being desirous of resuming the experiments in this direction which were unfortunately dropped about a year ago on account of the failure of funds, had appointed a Committee to endeavour to bring up the sum in hand to £300. The sum of £75, 7s. had been collected. Considering that a special grant had been applied for to the Board of Agriculture, which it was hoped would be given, the Directors proposed to resume these experiments in the ensuing autumn, and with a view to that object had appointed a Committee to co-operate with Dr Aitken and Professors M'Fadyean and Woodhead in carrying out these experiments.

A vote of thanks was given to the Chairman, and the proceedings terminated.

#### GENERAL MEETING IN THE SHOWYARD AT STIRLING, 29TH JULY 1891.

A meeting of the members of the Society took place in the pavilion at a quarter to twelve o'clock. The DUKE OF MONTROSE presided.

The CHAIRMAN said that before commencing the proceedings they would allow him, on behalf of the county, to express their congratulations and thanks to the Society for coming there, and to say that they hoped the present would be a prosperous and successful Show.

#### VOTES OF THANKS.

Sir JAMES GIBSON MAITLAND moved the thanks of the Society to the Provost, Magistrates, and Town Council of Stirling for the assistance they had given to the Society. It was ten years since the Society met at Stirling before, and he hoped that the present Show would surpass all that had gone before it in this district.

Mr FISHER, Jellyholm, seconded the motion, which was unanimously passed.

Provost YELLOWLEES, in acknowledging the vote, said that as a municipality they thought it their duty to do what they could to promote the success of the Show. They were very much pleased to know that their efforts in that direction met with such generous appreciation.

The MASTER OF POLWARTH said that a vote of thanks was due to the District Committee nominated for the Stirling Show, to Sir James Gibson Maitland of



Barnton, Bart., and to the individual members of that Committee for carrying into effect the arrangements for the meeting. Coming as he did from another district, he had much pleasure in moving this vote of thanks. The arrangements for the meeting were as satisfactory as possible. He felt certain that every member of the Committee had done his best for the success of the Show.

Mr McQUEEN of Crofts seconded the motion, which was carried unanimously.

Mr GORDON of Newton moved a vote of thanks to the subscribers to the guarantee fund. This was the first occasion, he remarked, on which the Society had to rely for local subscriptions upon entirely voluntary aid. With the appearance of the new County Councils, as they were all aware, the machinery which used to be put in force to collect auxiliary funds for the Society had disappeared from the face of the earth. They were all the more glad, therefore, to return their sincere thanks to the gentlemen who had voluntarily come forward to aid the Society.

Mr ELLIOT of Wolfelee, in seconding the motion, said they were glad to know that the funds were there though the machinery had disappeared.

The Rev. JOHN GILLESPIE moved a vote of thanks to donors of special prizes. This, he believed, was a new departure in the way of giving thanks on this general thanksgiving day. A class of persons, however, had sprung into existence who deserved their most cordial recognition, and that was the donors of special prizes. It was a very general impression that the Highland Society was an exceedingly wealthy body, and did not require that any prizes should be offered from the outside whatever. But those who were more immediately connected with the administration of the Society knew that of late years with Shows not always profitable the money very soon went away. He was sure they all appreciated the liberality of those gentlemen who came forward to give some special prize for some class of stock in which, perhaps, they were specially interested. It was a very good way to show their interest in any particular stock. As gratitude was said to be a sense of favours to come, they might hope that the liberality of the past would even be exceeded in the future, and that many handsome champion cups and prizes would be given by those who were interested in the great work the Society carried on. He formally moved: "That the cordial thanks of the Society be tendered to those who offered special prizes on the occasion of the General Show being held at Stirling—viz.: The Clydesdale Horse Society of Great Britain and Ireland, and Lord Polwarth, ex-President of that Society; Mr Macpherson Grant of Drumduan; Captain Clayhills Henderson of Invergowrie, R.N.; Mr Howatson of Glenbuck; and Mr Smith of Ardmornish."

Mr MARTIN of Auchendennan seconded the motion, which was cordially adopted.

#### FINES FOR NON-EXHIBITION.

Mr D. C. BRUCE, Byres Farm, Fochabers, moved the following resolution, of which he had given notice: "That the fines for non-exhibition of animals at the Society's General Shows be collected impartially or abolished altogether." In submitting his motion, Mr BRUCE explained that he had entered an animal for the Dundee Show under the usual conditions. Some time after making his entry, the Directors of the Society had thought fit to impose a new condition, which prohibited his animal from competing at Dundee, and then they imposed upon him a fine for not forwarding his entry. He argued that not only should he have been exempt from the penalty for non-exhibition, but he thought he should have had his entry money returned. The latter part of his motion had been suggested as the result of his correspondence with the Secretary, which brought out that fines were not imposed on several exhibitors who had failed to send their exhibits to Melrose Show in the previous year under exactly similar circumstances to his own. He was not at all opposed to fines being levied for non-exhibiting of entries from frivolous causes, but in his own case he had been prohibited from exhibiting and then fined for not doing so.

Mr INGLIS of Newmore seconded the motion.

Mr GORDON of Newton said he had been requested by the Directors to answer the observations of Mr Bruce. As to the Melrose Show of two years ago, it was rather difficult for him to speak in detail, because he was not a Director in that year. But he knew that notice was only sent to those who exhibited cattle at the Royal Northern Show, to which Mr Bruce alluded, within two or three days of the Show being held at Melrose, and for the reason that the outbreak of pleuro had occurred suddenly in close proximity to the Aberdeen showyard. The exhibitors in the north, under these circumstances, could not possibly send their cattle to Melrose, and that was the reason why the Directors on that occasion did not see fit to enforce the fine. As regards last year, he recollected well enough what happened. The Directors of the Highland Society passed a resolution that no animal which had within three months come within a radius of two miles of the infected circle in the county of Aberdeen should be allowed to be sent to the Highland Society's Show. At a meeting of the Royal Northern Society, he was requested to come to the meeting of the Highland

Society on the 16th or 18th of June, and try to intercede on behalf of the Royal Northern exhibitors, in order that cattle might be sent to both Shows. He succeeded at that meeting in obtaining considerable concessions; but unfortunately another outbreak occurred, and that was the reason why it was resolved that cattle could not be sent both to the Aberdeen and the Dundee Shows. He thought Mr Bruce was not quite correct in saying that the entries were closed before that resolution was sent out. The cases of Melrose and Dundee were therefore not alike in that respect. People had a perfect option of exhibiting either at Dundee or Aberdeen.

Mr ELLIOT of Wolfelee said there was then a body called the Local Authority for the county, and that body would not have allowed cattle to go to Dundee at the time from an infected district.

The DUKE OF MONTROSE said the matter concerning the Melrose Show had already been discussed at a General Meeting; therefore it was not competent for it to be brought up again. He had been under the impression that what Mr Bruce referred to had been the Dundee Show of last year, but Mr Bruce apparently did not complain that they were not impartial there. He was going to make a suggestion which might perhaps meet the views of the members, and that was that Mr Bruce should delete the word "impartially," and move that fines for the non-exhibition of animals be abolished altogether. (Cries of "No, no.") Then he was afraid that Mr Bruce was out of order, because the Melrose Show matter had already been decided, and could not be again gone into.

Mr SUTOR, Collie, said it seemed to him that Mr Bruce's case was on the same footing as Mr Gordon's in this respect, that in both instances entries were made for the Dundee Show, and for the Melrose Show, prior to the resolution being come to by the Directors to exclude these animals. He took it there was no difference whether the entries were made a day prior to the resolution or a month. It was not a question of time, but a question of fact.

The Rev. JOHN GILLESPIE, Mouswald, said it would be in the recollection of the meeting that twelve months ago that matter was pretty fully debated. Mr Gordon, as representing the north, had brought the matter very fully before the Board on various occasions, and had been good enough to come south from Aberdeen to Edinburgh for the express purpose of having an interview with the Board there. The result of that was that the resolutions originally intended were considerably modified. As a matter of fact the resolution regarding Dundee had been passed by the Directors long before the entries closed. Therefore, every one who took the trouble to make himself acquainted with the regulations then in force must have been aware that if he sent his cattle to Aberdeen he must undergo the penalty of being prohibited from sending them to Dundee, and also the further penalty of paying the fine. As far as his observation went, fines were perfectly impartially levied. He believed the whole administration of that Society by the Secretary was perfectly impartial. It was within his recollection that entries had been rejected from the highest person in the realm this year because they were a little too late. They had not the benefit of her Majesty as an exhibitor because Mr Menzies, being an official and an impartial man, gave justice to all alike. His Grace the Duke of Buccleuch had been a great deal out of pocket in the previous year because he had thought fit to withhold animals that he had entered in consequence of a scare of pleuro. He added his testimony to what had been already said, that Mr Menzies in the discharge of his duties was perfectly fair to all alike, as he had reason to know that in his own experience. He moved the previous question.

Mr STEWART of Inverfildoch said the question before the meeting was not whether or not the general entries were closed, but whether this particular entry of Mr Bruce's was made before the resolution of the Directors. He wanted to know from the Secretary, who was standing in the background, as to that point. He thought they were entitled to ordinary courtesy at any rate.

The CHAIRMAN. I am sure you will get it here.

Mr STEWART thanked his Grace for saying so, but he could give an instance where he did not get it yesterday from the Secretary of the Society. He wanted to know if it was not the case that the Secretary had a correspondence with Mr Bruce on the subject. The meeting was entitled to have that correspondence before it before it gave an opinion. The correspondence would speak for itself. If the Secretary was worth all the praise that the noble Chairman gave him, he thought he would be able to produce that correspondence and give the meeting the benefit of it.

The SECRETARY (Mr Fletcher Menzies) said that Mr Stewart should have given him notice that he meant to ask for the correspondence. The correspondence was in Edinburgh, and could not be produced.

Mr STEWART. No, it is not very convenient to produce it!

The SECRETARY said it was quite convenient, and he should do so at next meeting if any one asked for it.

Mr WILSON, Manswraes, moved that fines for non-exhibition of animals be abolished altogether.

Mr BRUCE said he would withdraw his motion, and the subject then dropped.

#### THE INVERNESS SHOW, 1892.

Mr FORBES of Culloden said he had pleasure in intimating that subscriptions towards the Inverness Show had been coming in in a very satisfactory way. When it was intimated that the Highland Society's Show would probably be held in the north next year, committees were appointed. It was a wide district, extending from the confines of Morayshire to the Orkney and Shetland Islands. It was, indeed, the largest district the Society had. The returns had not yet been completed in all the different parts of it, but so far as they had gone they were most encouraging and very satisfactory. As had been stated already, they could not now impose any assessment as formerly; but he thought that notwithstanding that, they would get support from those who never gave support before, and from those who were not specially connected with agriculture. The impression among many was that the Society was a very wealthy body, but it certainly also had a large expenditure, and they knew some auxiliary aid was necessary before a show could be held in any district. He could not exactly say what the subscriptions would amount to, but thought he was safe in saying that there would be £800 or £900. Since he came to that meeting he had received a telegram from the Duke of Fife offering £25 towards the funds. The subscriptions varied from 2s. 6d. to £50, and if that meeting resolved that the Show should be held in Inverness in 1892, he could offer them a hearty Highland welcome. If it was so decided, it would encourage them to go on increasing their support and gaining more money. He thought that if the Society did go to the north, the question might be considered whether the premium list should not in some measure be altered, because there were certain kinds of stock of which perhaps they had not many in the north, and in that way some little money might be saved to the Society. If the Society determined to go north, he was sure a large sum of money would be added to its funds.

Major JACKSON of Swordale said, as far as Ross and Cromarty were concerned, they were receiving subscriptions both from those who were and those who were not interested in agriculture. Within the last ten days they had got two-thirds of the sum Ross-shire contributed on the last occasion. Mr Forbes of Culloden had made some remarks about the modification of the premium list. Now, in most Highland counties fisheries were the principal industries, and he hoped that some recognition would be made of that fact, and some encouragement given to that particular industry.

The SECRETARY said that in the last Inverness prize-list there were prizes offered in connection with the fishing industry, but there was not a single entry.

Major JACKSON said that he was sure there would be next year if the prizes were offered.

The CHAIRMAN said he supposed it would be their pleasure that they should go to Inverness next year.

The Rev. JOHN GILLESPIE thought that, as their friends in the north had not fully subscribed the requisite amount, they should let the matter lie over until the January meeting. (Cries of "No.") He had not the slightest doubt but that they would raise the money, but in what he proposed he was only following the precedent set in reference to the Dundee meeting. It would be a bad precedent if they were to agree to go to a district on an incomplete list.

Mr DUNCAN SHAW, W.S., Inverness, said that since Inverness was the capital of the Highlands, as long as the Society retained the word Highland in its name, it should follow the usual rotation.

The CHAIRMAN said he was very much of the same way of thinking. He would now put it to the meeting whether, after the statement they had heard from Culloden, they should not unanimously resolve to hold the Show in Inverness next year.

This was unanimously agreed to.

Colonel STIRLING of Kippendavie moved a vote of thanks to the Duke of Montrose for presiding, and especially referred to the services his Grace had rendered to the Society by obtaining for them the use of the park in which they were met at an earlier period than they would otherwise have got it.

This motion was passed, and the meeting terminated.

## ANNIVERSARY GENERAL MEETING, 20TH JANUARY 1892.

Sir JAMES GIBSON-CRAIG of Riccarton, Bart., in the chair.

The CHAIRMAN said: Gentlemen, this is a peculiarly sad occasion on which we have met. Our difficulty has been whether this meeting ought to have been held at all to-day; but we think it certainly should have been held, if only for one reason, and that is, that the National Agricultural Society of Scotland should on such an occasion pass votes of condolence with the Royal Family in their dire affliction. After that, we find that we must elect office-bearers, or else the working of the Society would get out of gear altogether; but having done that necessary work, we propose then to adjourn till this day fortnight.

The SECRETARY (Mr F. N. Menzies) read the proposed votes of condolence, which were signed by Sir James H. Gibson-Craig, and were in the following terms:—

‘Unto the Queen’s Most Excellent Majesty.

“MOST GRACIOUS SOVEREIGN,—We, your Majesty’s most loyal and devoted subjects, the Highland and Agricultural Society of Scotland, incorporated by royal charter, in General Meeting assembled, beg leave to approach your Majesty with our most sincere and heartfelt condolence on the severe calamity which has befallen your Royal House by the sad death of his Royal Highness the Duke of Clarence and Avondale—a Prince whose intelligence and strong desire to do his duty in his exalted position had raised him high in the opinion and endeared him to the hearts of the country. The sadness of his death is rendered still more melancholy by the prospect of his marriage. Amidst the afflictions of this sad event, it must be consolatory to your Majesty to know that, in all that bears on the happiness or grief of your Majesty and your Royal Family, you have the loyal affection and deep sympathy of all your people.”

‘Unto his Royal Highness the Prince of Wales.

“MAY IT PLEASE YOUR ROYAL HIGHNESS,—We, the Highland and Agricultural Society of Scotland, incorporated by royal charter, in General Meeting assembled, desire to approach your Royal Highness and her Royal Highness the Princess of Wales with the offer of our most sincere and heartfelt condolence on the early and unexpected death of his Royal Highness the Duke of Clarence and Avondale, and to express to you our deep sympathy on the sad calamity which has turned your house of rejoicing, on the auspicious event of his approaching marriage, into a house of mourning. His Royal Highness had endeared himself to the nation by his intelligence and the high sense of the duties of his exalted position, and the nation deplores his loss. We hope it may be consolatory and gratifying to your Royal Highness to know how deeply your sorrow has touched the hearts of the people, and how sincerely they mourn with you in your sad affliction.”

“To her Serene Highness Princess Victoria Mary of Teck.

“MAY IT PLEASE YOUR SERENE HIGHNESS,—We, the Highland and Agricultural Society of Scotland, incorporated by royal charter, in General Meeting assembled, beg to approach your Serene Highness and to express our deepest sympathy and most sincere condolence with you on the terrible grief into which you have been plunged by the most melancholy and unexpected death of his Royal Highness the Duke of Clarence and Avondale. We dare not attempt words of consolation, but it must be gratifying to your Serene Highness to know how universally he had endeared himself to the nation by his intelligence and his devotion to the duties of his high position, and by his kind and gentle disposition. We trust that God in His mercy may bind up your broken heart.”

The resolutions were unanimously adopted.

The following office-bearers were elected in place of those retiring: *President*—Sir George Macpherson Grant of Ballindalloch, Bart. *Vice-Presidents*—Donald Cameron of Lochiel; Sir Kenneth S. Mackenzie of Gairloch, Bart.; John M. Martin of Auchendunnan; Charles Howatson of Glenbuck. *Ordinary Directors*—Sir John Stirling-Maxwell of Pollack, Bart.; Robert Sinclair-Scott, Craigievar; Sir Robert Menzies of Menzies, Bart.; Robert Paterson, Hill of Drip; Sir James H. Gibson-Craig of Riccarton, Bart.; John Marr, Cairnbrogie; Rev. John Gillespie, Mouswald; Jonathan Middleton, Clay of Allan; James T. S. Elliot of Wolfelee. *Extraordinary Directors*—A. D. Mackintosh of Mackintosh; Sir Kenneth J. Matheson of Ardrross, Bart.; Eneas W. Mackintosh of Raigmore; Major Rose of Kilravock; Major Randle Jackson

of Swordale; James Douglas Fletcher of Rosehaugh; Alexander Ross, Provost of Inverness; John Miller of Scrabster; James Black of Sheriffston; Donald M'Lean, Dunrobin; Sir Allan R. Mackenzie of Glenmuick, Bart.; George J. Walker, Portlethen; John Kerr, Broomhouse; James M'Queen of Crofts; Captain Clayhills Henderson of Invergowie, R.N.; David Buttar, Corston; Alexander Murdoch, Gartcraig; Campbell Macpherson Grant of Drumduan; Andrew Mackenzie, Dalmore; Alexander Maccluff of Bonhard. After transacting this business the meeting adjourned till 3d February.

#### ADJOURNED ANNIVERSARY GENERAL MEETING, 3d FEBRUARY 1892.

Mr MARTIN of Auchendennan, Vice-President, occupied the chair, in the absence of the President, Sir George Macpherson Grant of Ballindalloch, Bart., who was prevented by indisposition from being present.

#### NEW MEMBERS.

Seventy-four new members were balloted for and duly admitted.

Seven holders of first-class certificates in Forestry were elected free life members in terms of the by-laws.

#### VOTE OF THANKS TO THE DUKE OF MONTROSE.

The following resolution was unanimously adopted: "That his Grace the Duke of Montrose having presided over the Highland and Agricultural Society during the past year, the thanks of the Society are due to his Grace for the zeal exhibited by him in promoting its prosperity, for presiding at the General Meeting of members and public banquet held at Stirling on the occasion of the General Show there, and for the dignity and urbanity with which he discharged the duties of the office of President."

#### RETIREMENT OF MR DUNCAN.

The CHAIRMAN said that it was with great regret that the Directors were informed at a recent meeting that Mr Duncan, who had so long and faithfully served the Society, had now, owing to ill health, decided to resign his office as one of their clerks. A Committee had been appointed to consider the matter, of which Sir James Gibson-Craig was Convener, and who would report on the subject.

Sir JAMES GIBSON-CRAIG said that after considering fully the matter, the Committee had, as the only precedent to go by, the case of one of their officials in 1826, when they gave him two-thirds of his salary as retiring allowance. Under the present situation of the finances they thought that they would be able to give a retiring allowance of £150 a-year, and he moved that the Society should express their regret at losing Mr Duncan's services, and grant him a pension of £150 a-year.

Mr ELLIOT, Hollybush, seconded the proposal.

The Rev. JOHN GILLESPIE, on behalf of the Committee, said after careful consideration they had come to the conclusion that £150 a-year would be a competent allowance.

The recommendation of the Committee was unanimously adopted.

#### BY-LAW No. 5.

Sir JAMES GIBSON-CRAIG submitted for confirmation the following by-law proposed to be substituted for No. 5: "The Society shall annually, at the General Meeting in January, choose out of the ordinary members a Board of thirty-two Directors, one-half of whom shall, at the date of their being so elected, be tenant-farmers or others who, if they were then to be elected members of the Society, would fall within the description of those who would have to pay the lower subscription under the terms of the second by-law. At the same meeting the Society shall also choose twenty Extraordinary Directors, ten of whom shall be resident in the district in which the Show of the year is to be held; the other ten shall be selected because of their known interest in and experience of the business of the Society, and of these five shall, when so selected, be either tenant-farmers or others who, if they were to be elected members of the Society at the date when selected, would come within the description of those persons who are entitled to become ordinary members of the Society under the second by-law."

The by-law was unanimously confirmed.

ACCOUNTS FOR 1890-91.

Sir JAMES GIBSON-CRAIG, Bart., in the absence of the Treasurer, submitted the accounts for 1890-91, which were approved.

ARGYLL NAVAL FUND.

Captain CLAYHILLS HENDERSON of Invergowrie, R.N., submitted the accounts for 1890-91, which were approved.

THE LOSS ON STIRLING SHOW.

Mr COWE, Balhousie, said he did not wish to move any amendment in regard to the financial statement which had been submitted, but he thought it must be very painful to the Directors, as well as to every member of the Society, to observe the state of their funds. It certainly could not be encouraging to think that over their Show at such a popular place as Stirling the Society should have lost over £500. If it were only Stirling it would not be quite so bad, but over the Shows at Glasgow and Melrose they lost a total of over £1810. If they deducted the surplus of £162 at Dundee, they were still left with a deficit of £1647, which, with the loss sustained at Stirling, brought out a total loss, and consequent draft upon their capital, of £2213 over the last four years. For the honour and credit of the Society, the Directors ought to appoint a small Committee, and there ought to be a thorough investigation into the whole workings of the Society. An overhaul of the management ought to be entered into immediately. Their establishment alone cost them £1486, and yet he saw in the accounts certain items—addressing circulars, &c.—for which their own clerks ought to have been sufficient. He saw, too, that the attendants at the turnstiles at Stirling absorbed £174, or an average of £43 for each of the four days.

Sir ARTHUR GRANT of Monymusk asked whether some means could not be taken in future to obviate these deficits by bringing the Show rather "up to date"? He had been at many English Shows, and it seemed to him the Highland Society's Show had remained in something like the same condition it was in when the gentleman who had been referred to retired, seventy years ago. The working dairy at Dundee was a crowd, where nothing could be seen; and at Stirling it was simply a place for selling crushed strawberries. Taking the Show altogether, it was as badly organised and arranged as any Show could be, and it would have been a great wonder if it had paid.

Sir JAMES GIBSON-CRAIG said these deficits had been a source of great anxiety to the Directors, and one great difficulty they had was that whenever they proposed to make a little retrenchment there was immediately an agitation by the persons about to be retrenched. He did not know what was meant by the suggestion to overhaul the establishment. For ten years the members had had an opportunity of overhauling the Board of Directors, and they could replace them if they were dissatisfied with their action. They always had had a deficit at Stirling, and in his opinion they always would have. Stirling was a place that lived on the reputation of the 1873 Show, and the Shows there would not usually pay. It was within thirty miles of three other big Shows, which practically gave the people three Highland Shows in the course of eight years, and they could not expect them to turn out as largely as they would otherwise do. The Directors had had a Committee sitting for some time to go into these constantly recurring deficits, and see in what way they could get rid of them. Many of the recommendations had been adopted by the Board, and some were still under consideration. Referring to the cost of the working dairy, he said that was not introduced by the Directors, but was insisted upon and thrust down their throats by outside members. The Directors wished to be as economical as possible, and would do their best for the Society so long as they were honoured with the confidence of the members.

Colonel WILLIAMSON said he submitted very plainly that the general management of the Society did not meet with the approval of those who attended the annual Shows. They had been challenged to disapprove of the selection of the Directors, but he thought that what they would wish to point out was that they did not think the Directors were fortunate in the selection of their officials. He thought, to put it quite plainly, that there was a feeling that there might be some change in regard to the management of the Secretary—possibly in the Secretary himself, or in the staff. He thought that was the feeling of a large number of gentlemen who attended that Agricultural Society. What they really asked the Directors to consider was as to whether they had a proper staff, or if their officials were really qualified to conduct the great business which ought to be carried on by that influential Society.

Mr HUTCHESON, Dundee, said he held the dairy interest in Scotland was coming to the front, and if the Society was going to put its foot upon it because they lost £100 at the last Show, they were great fools. They did not lose at Dundee. They put up the sheds, and they did not cost much. But when they took the management into their own hands the thing went to smoke.

Mr SPEIR, Newton, said it was reported in one of the agricultural papers last week that the gatemens and several of the attendants at the Show had been paid £5 a-week.

Sir JAMES GIBSON-CRAIG replied that it was not true. The gatemens were paid 2½s. a-week, and he thought the proprietors of the paper in question should have made inquiry before admitting such a statement into their columns.

The CHAIRMAN said he had no doubt publicity would be given to the denial.

Captain STEWART, Knockrioch, said the statement had gone abroad that at the Stirling Show numbers of people were fed at the expense of the Society in the Directors' room.

The CHAIRMAN replied that every care had been taken that no outsiders had admission to the Directors' room.

Captain STEWART said he was perfectly satisfied.

Mr YOUNG, 'North British Agriculturist,' said that, as the person responsible for the statement to which Mr Speir had referred, he might say that it was made to him by a person who was now present, and was discussed in the presence of two Directors who were also present. He was glad to know that they were misstatements, and he would take care that they were duly corrected.

The Hon. G. WALDEGRAVE-LESLIE hoped some notice would be taken of Colonel Williamson's observations. They had a very able Secretary, and he was very highly paid—though he did not grudge it—but he did not think it was quite meet that he should work at so many other things as he did. He believed that if their Secretary gave his whole time to the affairs of the Society they should not be in the present financial difficulty.

Mr FISHER, Jellyholm, said they surely would not have their Secretary poring over books all day. He must have some relaxation.

Mr WALDEGRAVE-LESLIE said the Secretary got very ample pay—£850. He did not grudge it, however.

The CHAIRMAN said Mr Waldegrave-Leslie, of all men, must know that this subject had been brought up at a public meeting of the Society some years ago, and the position of the officials clearly defined.

Colonel STIRLING of Kippendavie, as Convener, submitted a report as to the Stirling Show, and directed special attention to the subject of voluntary subscriptions. In three districts connected with the Stirling Show there had been a falling off of £129 in their voluntary subscriptions, and he hoped there would be a good whip-up at Inverness. Although there was £565 of a loss at the Stirling Show, the last time they were at Stirling there was a loss of £975. When this recent loss became known to the Directors at their meeting in November, they immediately appointed a Committee to go into the circumstances of the Stirling Show. This Committee had given in a report, some of the recommendations in which had been accepted, and others of which had been remitted back to the Committee for further report.

Mr ARCHIBALD M'NEILAGE, Glasgow, directed attention to what he considered the unsatisfactory nature of the rings for judging draught-horses, with only a rope separating the mares from the stallions, and he suggested that the Directors might with advantage follow the example of the Glasgow Society, and form a lane between the two rings.

Colonel WILLIAMSON asked if the Directors were satisfied with the management in detail of the Stirling Show, as well as of the preceding Show and the Show before that, because it was very evident that if the Directors were satisfied the general public were not.

Mr COWE, Balhousie, complained of the sleeping accommodation provided for attendants at their Show.

The Rev. JOHN GILLESPIE, Mouswald, said they had found that attendants would not go to a bothy; they must have somewhere to sleep near their animals. The Directors were open to receive any suggestions, however.

Colonel STIRLING, alluding to Colonel Williamson's question, said the fact of the Committee having been appointed to consider the circumstances of the Stirling Show proved that the Directors were not satisfied with the Stirling Show.

The subject then dropped.

#### THE INVERNESS SHOW.

Sir JAMES GIBSON-CRAIG reported that the General Show this year would be held at Inverness on 26th, 27th, 28th, and 29th July, the site selected being Tomnahurich Farm, immediately beyond the site where the Show was held in 1883, and which had the advantage of being level and dry.

Mr SINCLAIR SCOTT, Craigievar, asked if it was absolutely necessary that the entries for stock should close so long before the Show as 20th June? He thought it would be in the interest of the Show and of exhibitors if the period for receiving entries was put back a little.

Sir JAMES GIBSON-CRAIG said the date was put back a fortnight a few years ago.

The Directors must know in sufficient time what they had to provide for in the showyard.

Mr J. D. FLETCHER of Rosehaugh complained that there was to be no working lairy at Inverness. He did not see what the Society existed for, if it was not to promote all branches of agriculture. If they were afraid of a loss from a working lairy, he would be glad to guarantee £25 towards the fund.

The CHAIRMAN said that was just an example of what Sir James Gibson-Craig had referred to in persons desiring one thing and another in which they were specially interested. Mr Fletcher was a member of the Board of Directors, and the suggestion he had made would receive every attention, especially as he had backed it up by such a liberal offer. He hoped that others would supplement that offer by guaranteeing the whole amount necessary.

Mr FLETCHER said he did not think the Society had a right to expect private individuals in the north to make up the required fund.

#### A SCOTTISH REPRESENTATIVE ON THE BOARD OF AGRICULTURE.

The question of petitioning the Government on the subject of having a Scottish representative on the Board of Agriculture came up on the following motion, of which notice had been given by Mr Hutcheson, Dundee: "That this meeting resolve to request her Majesty's Government to appoint a Scottish representative on the Board of Agriculture; and also send copies of this resolution to the Prime Minister, the President of the Board of Agriculture, the First Lord of the Treasury, and the Secretary for Scotland."

The CHAIRMAN made a statement with reference to the position of the Directors on the subject. The Directors had originally petitioned in favour of having a Scottish representative on the Board of Agriculture, but at last meeting resolved by a majority to take no further action in the matter.

Mr HUTCHESON, in submitting his motion, said that before he had come to the meeting he had been told that he was brought there by Mr Gillespie. Long before Mr Gillespie wrote to him he had sent in his motion to the Society, and he was not under Mr Gillespie's leading-strings and never would be. He thought the action of the Directors had not been very consistent, after petitioning for a Scottish representative to resolve to go no further. It was not easy for outside members to know what was done at the Directors' meetings. They met in private, and he thought that was a mistake. He thought the Directors, if they had the confidence of the public in Scotland, should transact their business in public like any other board. He was told that at the meeting in January there were twelve members present, of whom eight voted one way and four the other, and it went out to the public that it was the feeling of the Society that they did not want a Scottish representative on the Board. He did not think that was a very representative vote. They were told they had the Secretary for Scotland on the Board, but what they wanted was the voice of a practical agriculturist, who was practically trained in the management of land and of stock. A letter in that day's 'Scotsman' suggested a good big thumping deputation to Mr Chaplin about pleuro and the horrid restrictions. He had never seen any good from these deputations. If they had a practical man on the Board, who could come down and investigate on the spot, it would have more weight than all the deputations they could send. He thought Mr Chaplin's reply, that the desire had been to obtain the services of a gentleman who would command general confidence, was rather a hit at Scottish agriculture, because, he asked, had they not a Scottish agriculturist who could command confidence in England? But independently of that, he maintained that the position had not been filled up, because Sir Jacob Wilson had got the post of Land Commissioner at £1500 a-year, and quite wise he was to take it; but Sir James Caird's place had not been filled up, and if that meeting did not vote to ask the Government to fill it up by a Scotsman, he had no further confidence in brother Scotsmen. He had been told that when Sir Jacob Wilson was in Edinburgh nearly the whole conversation turned on the vexed restrictions in Mid-Lothian, and that he was told by men who were Conservatives that unless these absurdly wide areas were altered, politics notwithstanding, they would vote for the hottest Radical in Scotland.

Mr JOHNSTONE, Alloway Cottage, Ayr, seconded the motion.

Mr GILMOUR of Montrave explained that he was much of the same feeling with Mr Hutcheson, that there was a very strong feeling in Scotland in favour of more direct representation of Scottish views of agriculture generally, but while they had got a good deal of knowledge as to the exact appointment that they thought was vacant, some of them had gone on a wrong conception of the office that had to be filled up. He thought present appearances showed that it was not very likely that they would obtain what they wished in the way desired by Mr Hutcheson. He moved—"That



this meeting resolves to request her Majesty's Government to give effect to the strong desire of the agriculturists of Scotland that means be taken by the appointment of a sub-commissioner, or otherwise, to represent more directly to the Board of Agriculture the views of practical agriculturists in Scotland.

Captain STEWART, Knockrioch, seconded.

Mr COWE said he believed the time was coming when Scottish interests would demand a Board of their own. He thought Mr Hutcheson was not going far enough.

Mr GORDON of Newton said that while he agreed with very much that had fallen from Mr Hutcheson, he must say that however much they might differ from Mr Chaplin and the Board of Agriculture as to the way in which they had set about the stamping out of pleuro, none could dispute that they had greatly succeeded in minimising the ravages of that disastrous plague, and that they were rapidly causing it to disappear from the soil of Great Britain. He did not care twopence for politics in this matter. This was a national question, which should be kept outside the area of politics altogether. After the declarations of her Majesty's Government and by Mr Chaplin, he thought Mr Hutcheson's motion would have the effect of hampering the Board of Agriculture.

Mr COWE. Is the appointment of a Scotsman hampering the Board of Agriculture? The CHAIRMAN. That is not a point of order.

Mr GORDON said he did not affirm that it was, but what he felt was this, that he very much doubted whether they could name one single Scotsman at this present moment who would unite all interests in Scotland on this very question of stamping out pleuro.

Mr FYSHE, Treaton, Markinch, supported Mr Hutcheson's claim for the appointment of a Scotsman to the Board of Agriculture.

The Rev. Mr GILLESPIE, in supporting Mr Hutcheson's motion, said some of them were not of the opinion that the appointment of a single member on the Board was the only possible solution of the difficulty. There might be other possible solutions. One reason why they suggested the appointment of a Scottish representative as a solution was that a Departmental Committee appointed by the Government, and presided over by Sir Jacob Wilson, recommended this very course. He quite agreed with Mr Hutcheson that this matter had been too much discussed in connection with pleuro. The Board of Agriculture was wide-reaching in its influence.

Mr GORDON. It descends to mice.

Mr GILLESPIE said that if the agriculturists of the north had had the experience of mice that those in the south had had, Mr Gordon's face would not have been wearing the pleasant smile it now bore. Proceeding, Mr Gillespie said that another Departmental Committee recommended in different terms, but substantially to the same effect. Those two recommendations were, he thought, sufficient warrant for those of them who had taken action to ask for a solution in this particular form. He did not concur with a previous speaker's opinion as to Lord Lothian's want of practical knowledge. If he were really on the Committee, and had the opportunity of taking part in its work, there was not a man in Scotland that he (Mr Gillespie) would place before him. Lord Lothian was a most painstaking and most capable man; but for all practical purposes he was not a member of the Board, though he was nominally upon it. He feared this question being mixed up, as it ought never to be, with party politics. The way to prevent that was calmly and deliberately for the national Society to make a representation to the Government, and say, "Here is our view, and we ask you to consider it, and do what you think best under the circumstances." Another fear he had was that his friend Mr Cowe should get a separate Board for Scotland. He would rather see Ireland and Great Britain under the same Board. In regard to swine-fever, for example, upon which Mr Chaplin had just been approached, they would never get that disease stamped out unless they could control Ireland.

Professor WALLACE said he thought the two opposing parties might be brought together by the following amendment, which he begged to move: "That the report of the Directors be confirmed, and that it be remitted to the Directors to see if the motion of Mr Gilmour can in any way be given effect to." He did not think a meeting like that was able to discuss deliberately that question—(cries of "Oh")—and he thought it would be better remitted to the Directors. The whole of this agitation had arisen through a misapprehension, and when that had been explained away he thought the agitation would be discontinued. Mr Gillespie had said that the Board of Agriculture, as represented by the Secretaries of State, never met—but would it be more likely to meet if there was a Scottish representative? Were they on a side-issue to change the whole system of the government of the country—(a voice, "Certainly")—which applied not only to that but to other departments? In addition to the Marquis of Lothian, the Society had the right with other bodies to send representatives to place their views before the Government, and he maintained that was the best possible way to enable the Board of Agriculture to come to a decision. The proposal of Mr Hutcheson was to have a representative on the Board for the whole

of Scotland, but he (Professor Wallace) held that no man could represent the majority and the minority at the same time. At present Edinburgh was in a minority as regarded the Slaughter Order, and although they felt they had a serious grievance, no man could go to the Board of Agriculture and say that nine-tenths of the farmers of Scotland were perfectly satisfied with the regulations, and then turn round and say that those in Edinburgh had a grievance and wished to have their regulations changed. If they persisted in this agitation for a representative from Scotland on the Board they would drift into politics. He regarded the resolution as a direct impeachment of the Secretary for Scotland as their representative. (Cries of "No, no.")

Sir ROBERT MENZIES, in seconding Professor Wallace's amendment, reminded the Society that the Board of Agriculture was composed entirely of Secretaries of State. (A voice, "And Professor Brown.") Professor Brown was the head of the Veterinary Department, but he was not a member of the Board. If they insisted upon their resolution they would alter the whole constitution of the Board, and he thought it would be better to leave it as it was.

Mr GILMOUR said Mr Gillespie had clearly told them that there had been very few meetings of the Board, and that very little had been done by them. In that case he (Mr Gilmour) did not think anything practical would result from their getting a Scotsman appointed to the Board. Another practical difficulty suggested by Mr Hutcheson's resolution was that of getting a thoroughly practical man to undertake this work at headquarters in London. They were all of one mind as to the necessity of having some more direct representation of their views; where they differed was as to the best mode of attaining their object, and he thought they were more likely to arrive at it through some arrangement by which the views of Scotland would be represented at headquarters through the Scottish Office.

Mr HUTCHESON, in reply, said he was very much astonished at Professor Wallace's remark that the vote of that meeting would not be a practical vote.

Professor WALLACE said he did not make that remark. What he had said was that they had not time to consider it.

Mr HUTCHESON replied that they had been considering it for months, and yet Professor Wallace thought the Directors were more capable of deciding it than the members of the Society. He was not inclined to accept Mr Gilmour's amendment, believing that they should go a step further. He was surprised that Mr Gilmour and Mr Gordon should think so little of the agriculture of Scotland as to say that they should not find a man able to fill that post.

Mr GILMOUR. I said it would be very difficult to do so.

Mr GORDON. I said that I knew no man in Scotland who would unite all the different interests of the different districts with regard to the stamping out of pleuro-pneumonia.

Mr HUTCHESON, referring to a further remark by Professor Wallace, maintained that every Scottish agriculturist condemned those wide areas fixed under the Slaughter Order—(cries of "No, no," and "Hear, hear")—and they also disapproved of the stamping-out process. ("No, no.")

A vote was then taken, when the motion of Mr Hutcheson was carried by 71 votes to 56.

#### AGRICULTURAL EDUCATION.

Rev. JOHN GILLESPIE, Mouswald, reported that the fourth examination of candidates for bursaries under the new by-law took place simultaneously at Edinburgh, Glasgow, and Aberdeen on the 15th October, when ten candidates presented themselves. The following were found entitled to bursaries of £20 each: Robert Affleck, jun., Rockstone Place, Castle-Douglas; Marcus C. Wood, Midhouse, Evie, Kirkcaldy; John W. Forbes, 14 Park View Terrace, Forfar Place, Dundee; James Wilson, West Mains, Dolphinton. Mr Gillespie then reported that the examination of candidates for the Society's agricultural certificate and diploma had been fixed to be held on the 23d, 24th, and 25th March, candidates being required to lodge intimation before the 16th of March. Mr Gillespie further intimated that, in view of the Government grant for technical education to County Councils, the Highland Society cannot be expected to contribute to agricultural education after this year.

#### FORESTRY DEPARTMENT.

Sir ROBERT MENZIES reported the result of the examinations in Forestry, and stated that Colonel Bailey, Royal Engineers, had been appointed Lecturer on Forestry in Edinburgh University.

Dr CLEGHORN expressed great satisfaction at Colonel Bailey's appointment, and said he had not the least doubt he would prove a most valuable instructor.

## REPORT BY CHEMIST.

Dr AITKEN presented the following report:—

A large number of experiments were carried out last year by the members of research associations throughout the country, under the supervision of their respective committees. Two experiments were proposed: one to determine how most profitably to apply soluble nitrogenous manures to the turnip crop, and the other a repetition of the main experiment of the former year—viz., Experiment VIII.—to determine what is the best and cheapest mixture of artificials to apply to the turnip crop, both with and without farmyard manure.

Most of the associations elected to try both experiments. I expect from the repetition of Experiment VIII. we shall derive useful information on the effects of climatic conditions on the action of light manure. The weather during last year was very abnormal—viz., a dry spring, a cool summer, and a wet autumn; and these conditions will doubtless produce results different from those of the former year, in which the spring was wet and the autumn dry over the eastern half of the country.

A feeding experiment, lasting over three months, was carried out by Mr John Milne, at his farm, Mains of Laithers, the subject being an ox fed in the specially constructed stall belonging to the Society, and the object being to determine the relative feeding value of grass, and of the hay made from it. For this purpose grass was cut daily, one-half of it was consumed by the ox, and the other made into hay during the first month; and the hay was consumed during the second month precisely in the same order as the corresponding grass had been eaten the month before, the only difference between the two months' feeding being that in the one month the fodder had its natural sap in it, and in the other it had not. During the third month the fodder was green tares. The ox was weighed regularly, and the whole experiment was under analytical observation, the details of which will be published in the 'Transactions'; but the main result was that the animal made greatest progress during the second month, while feeding upon hay.

An extensive experiment was carried out in Ayrshire by the members of the Agricultural Science Association there—viz., the keeping of an accurate dairy record on ten farms. The quantity of milk yielded by ten or twelve cows at each farm was determined daily for about four months. Samples of the milk of all the cows were sent in regular fortnightly rotation to the laboratory for analysis, at the rate of about sixty samples per week, making about 800 samples in all. Owing to the coldness and dryness of the spring, grass was late in coming and very deficient in quantity, and the yield of milk was much below average.

The grass experiments at the Society's experimental station at Pumpherston were much affected by the inclemency of the weather, for during cold dry seasons artificial manures have less effect upon grass than upon any other crop. The manures are applied as top-dressings, and unless they have rain to wash them down they cannot reach the roots of the grasses.

The returns from the analytical associations have been scrutinised and the cases of deficiency considered by the Chemical Committee. The number of such cases is greater than usual, showing that there is still need of care and watchfulness on the part of buyers. Members of the Society who wish to protect themselves against loss in the purchase and application of manures and feeding-stuffs should read carefully the instructions, rules, and general information contained under the heading "Chemical Department" in Appendix B of the 'Transactions,' copies of which may be had on application to the Secretary.

The number of analyses for which grants are claimed this year is 266, a greater number than on any former occasion; and the grant in aid amounts to £110.

## POTATO DISEASE.

Dr AITKEN also reported that, at the request of the Board of Agriculture, a very careful set of experiments had been carried out in the counties of Berwick, Renfrew, and Forfar, with the view of ascertaining the effect of a sulphate of copper mixture in the prevention of potato disease. The main result had been to show that the spraying of potatoes in the manner directed had not produced any effect whatever in diminishing the amount of disease in the crops treated.

## BOTANICAL DEPARTMENT.

Professor M'ALPINE said: I have the honour to report that the results of the investigations on the old pastures of Scotland are now in the hands of the Botanical Committee. The leading points dealt with are: (1) the proportion of clover to grass; (2) the conditions which favour or retard clover-growth; and (3) the causes which lead to pasture deterioration. I have found that the mossy condition of old grass-land is due simply to the circumstance that the mere superficial layer of the soil is most fit

to support plant-life. Good plants cannot live in this thin layer—they require depth of suitable soil. Deprived of this they die out, leaving the land to moss and worthless species. This means that the whole soil except the mossy surface is acting as a sub-soil. The remedy is easy when the cause is understood. It has also become clear that our pastures are to be improved in the next place by getting a good blade of grass to grow in place of one which is bad; when this has been accomplished, attention may be directed to the production of two blades instead of one.

It is premature to speak fully regarding the seeds of the present season; nevertheless one or two points may be noticed. The examples of perennial ryegrass which have passed through my hands are fairly good and pure, the germinations varying between 98 and 80 per cent. The best Italian examined germinated 92 per cent, and the worst 60 per cent; cocksfoot varies between 94 and 50 per cent germination; meadow fescue between 96 and 90 per cent; foxtail between 65 and 25 per cent. The clovers examined were below the average, and the white as a rule contained an extra percentage of hard seeds.

#### DAIRY DEPARTMENT.

Mr M<sup>Q</sup>UEEN of Crofts reported that the £100 voted to the Dairy Department last year had been divided as follows: £60 to Kilmarnock Dairy School, and £20 each to the Royal Northern Society, and the Angus and Mearns Dairy School. He asked a similar grant for this year, on condition that if the County Councils continued grants to the dairy schools the grant by the Society would not be expended.

This was agreed to.

#### PREMIUMS FOR REPORTS.

The Rev. JOHN GILLESPIE, Convener of the Committee on Publications, reported the premiums awarded for reports lodged in November 1891; and those offered in 1892, which appear in the Premium-Book.

The report was approved.

#### DISTRICT SHOWS AND COTTAGES AND GARDENS.

Mr BUTTAR, Corston, gave in the report of the Committee on District Shows and Cottage and Garden Competitions, and said that, in view of the present position of the Society's finances, the Committee felt it their duty to recommend the withdrawal of the grant of £20 which had been given in the past to the Ayrshire Agricultural Association for the Kilmarnock Cheese Show, that Association being, in their opinion, in such a flourishing condition as not to require assistance.

Mr J. H. TURNER, Portland Estates Office, said their Show at Kilmarnock was a national one, being the only Dairy Show in Scotland, and the premier Cheese Show of Great Britain. It was far from being self-supporting, there being last year a loss of £270, and unless it continued to receive the support of the Highland Society, he was afraid the Show would go down. He moved that the grant of £20 be continued as heretofore.

Mr ANDREW ALLAN, Munnoch, seconded.

Captain STEWART, Knockrioch, moved the adoption of the report. He thought that £40,000 worth of cheese and butter did not require £20 to back it.

Sir ROBERT MENZIES seconded.

After some further discussion Mr Turner's motion was carried by a large majority.

This concluded the business, and a vote of thanks to the Chairman brought the proceedings to a close.

## PLAGUE OF MICE OR VOLES.

(INFORMATION COLLECTED BY THE HIGHLAND AND  
AGRICULTURAL SOCIETY OF SCOTLAND.)

RICHARD BELL, CASTLE O'ER, LANGHOLM.

F. N. MENZIES, Esq.

28th January 1892.

DEAR SIR,—I have yours of 26th inst. as to the plague of mice or voles, and I may say that I am most willing to give any information in my power on the subject, though I fear that I can scarcely add to what has already appeared in the newspapers.

There is no doubt farmers are undergoing a serious trial, and, I am strongly of opinion, are helpless, unless some natural cause stays the plague. I am very certain man himself cannot do it, and equally so that all the small hawks, owls, weasels, stoats, &c., that are ever seen on the hills are unable to do so now.

Think of the extent of country ravaged, and see the millions of holes in which the voles shelter, and one cannot imagine how human power, at any rate, could now do any good. I see from the papers that *one* man killed 32,000 on one farm. Supposing this to be true, it shows that the voles are there in such myriads that those he saw on the surface of the ground in daylight must have been as a drop in the bucketful hidden in their runs and amongst the long grass. My own ground is now badly affected, and my shepherds are unable to kill any appreciable number. We certainly see the voles, but they go like a streak from one hole to another, so that it is almost impossible to hit them. Digging holes or poison (illegal?) I am sure would be futile now. Had the plague been confined to a small space, they might be destroyed by continued effort; but when the ground affected is thousands of acres in extent, and holding millions of voles, man's work would be a gigantic one indeed. I am strongly of opinion the continual destruction of their natural enemies, combined with the last few mild winters, is the first cause of the plague. Since it began, a great number of small hawks and owls (weasels and stoats are not so visible) have gathered to it; but what avail are a few dozen or scores of these birds to extirpate such an army of voles. Some years ago the same lands were ravaged with caterpillars, to feed on which starlings gathered together, not in scores, but in countless thousands. When I saw these flocks pass my house every evening for weeks during two hours, to roost at some unknown place, and returning again in the morning, I could understand them able to fight the battle; but all the birds and beasts of prey which are here, assisted by man, are as a flea-bite against the voles, compared to the starlings against the caterpillars.

With these opinions I can suggest no human remedy, and we must now only pray nature to come to our aid. If nature answers our appeal, I fear the cure will be as bad, temporarily at least, for the sheep. My only hope would be a sudden thaw after heavy snow to drown them in their holes—those escaping to perish in the slush—or a hard frost suddenly stopping the thaw and sealing up their holes.

With regard to names of farms affected, I may say that the whole of this parish—Eskdalemuir—is bad, more or less. The plague began in the highest land, such as Aberlosk, Langshawburn, Moodlaw, Dumfedding, Fingland, Cassock, Clerkhill, and then spread downwards and outwards till every farm round about is suffering. My own ground of Cruvie and Castle O'er has become very bad in places since autumn began. The damage is not so apparent here at the first glance. The higher lands were bad all summer, and the grass destroyed then has withered away, showing the

bare soil, I understand. Here the damage is more recent, and the cool damp atmosphere has kept the grass moist and green; but I find, on scraping aside the grass, the roots have all gone, and the soil bare below: a bad spring will be a great disaster, I fear. Excuse this long letter; but I understand you to want all the information I could furnish, and I have done so, along with my own opinions on the subject.

If the Board of Agriculture send inspectors to this parish, which is approachable from Lockerbie Station, Caledonian Rail, I shall be glad to offer them hospitality when here, though I have no horse to drive them about.—I am, &c.,

RICHARD BELL.

THE REV. JOHN GILLESPIE, MOUSWALD MANSE, RUTHWELL, R.S.O.

F. N. MENZIES, Esq.

25th January 1892.

DEAR SIR,—I find from my inquiries the mice plague is more extensive in Dumfriesshire than I was aware of. It seems to prevail on most of the hill-grazings from Thornhill eastward along the northern boundary of the county of Dumfries. It varies a good deal in its severity on different farms. On some the mice or voles are swarming, and have done great damage—some sheep having been removed owing to the scarcity of keep, while those left have suffered in condition. Where they are not very numerous the farmers are, of course, fearing they will speedily increase; while others, whose grazings are as yet free from the plague, are afraid that it will come their way soon. I suppose such a general statement as the above will be sufficient in the meantime. I can easily get the names of the farms affected if the Board of Agriculture wish it. Of the serious and alarming nature of the plague there can be no doubt. The suddenness with which the mice have made their appearance on some farms is reported as being a striking feature in the history of the visitation. I fancy it is desirable any inspection and investigation that may be undertaken by the Board of Agriculture should, if possible, be set about soon, before the new grass comes. It might be desirable to inspect some of the ground after the new grass has sprung, as well as before the winter is quite past.—Yours sincerely,

JOHN GILLESPIE.

The following are some of the farms affected: in *Nithsdale*—Mitchelslacks, Gubhill, Craigshiels, Holehouse, Gilchristland, Auchencairn, Townfoot, and Morton Mains. In *Annandale*—Kinnelhead, Locherben, and other farms in Evan Water. In *Eskdale*, almost all the farms in the northern part of the parish of Eskdalemuir.

WALTER ELLIOT, HOLLYBUSH, GALASHIELS.

(*Sending the following correspondence.*)

F. N. MENZIES, Esq.

Jan. 30, 1892.

DEAR SIR,—I enclose a number of letters received in answer to mine: they are from reliable people, and have all the same story regarding the damage by mice. I have spent two days this week in the Ettrick district, and intend going into the Hawick district on Monday, and see some more of the farms. I was quite prepared before I left home to see a deal of damage; but one has no idea of the damage until one sees it. The mice are in myriads, and, over hundreds of acres, have eaten up every green thing. These letters do not exaggerate the matter in the least degree: it is the most serious matter that has overtaken the farmers in that district in any one's memory, and, worst of all, no one can see when or where it will end. There are already some thousands of sheep sent away to wintering. I saw droves of them going away the days I was there, and tons of Dutch hay being driven up to feed those that remain. That hay will cost nearly 20s. per ton to drive from railway station, some of it more. What they will do with their sheep in the spring, when they must come home, is more than I can see, unless some great change take place, and that speedily. I hope the Board of Agriculture will investigate the matter. I have no hesitation in saying there is more damage done upon one farm than all the damage over the whole country to the turnip crop by the moth or caterpillar that we heard so much about.—I am, yours sincerely,

WALTER ELLIOT.

P.S.—I sent the following questions to the parties: 1. The cause of the great increase? 2. The amount of damage done? 3. The time they appeared? 4. Is there much increase? 5. The method, if any, you have adopted for destroying them?

WALTER ELLIOT, Esq.

HOWPASLEY, HAWICK, N.B.,  
23d Jan. 1892.

In answer to your questions regarding the plague of mice or voles—

1. There is no doubt that the cause of their great increase is due to the great destruction of vermin, their natural enemies, by keepers, not as much those of the proprietors as those of the shooting-tenants.

2. The amount of damage is not easily estimated; but I may state that almost the whole of the bog land is at present totally worthless for pasture, while the white land is also very much overrun with them, and now they have begun to attack the heather.

3. We have had them more or less since they were so bad about fifteen years ago; but it is only within the last eighteen months that they have shown signs of increase, and during the last spring and summer the increase has been enormous.

4. At present their number is rather diminishing than increasing. They do not seem to be breeding to any extent just now; at the same time their area is increasing.

5. Several methods of destroying them have been tried, but all are failures, except men with sticks or light spades and dogs. In this way I have killed them at the rate of about one hundred per hour. Owls and sparrow-hawks are very plentiful here just now, but of weasels there are hardly any to be seen. Crows, at the time the mice were breeding, killed large numbers of young ones by tearing open their nests, and now they are attacking the old ones.

The other methods that have been suggested are—

1. Pits wider at the bottom than the top. These require to be at least 15 inches square at the top, and about the same in depth. I have tried them, and find that it takes a man about an hour to make four. Now Sheriff Russell, in recommending them to a gentleman in this neighbourhood, suggested twelve per acre, which means that a man could do about 4 acres per day—in other words, it would take twenty-five men thirty-eight days to go over the farm of Howpasley, without calculating on the extra work required on the braes, where you might have to make your pit 4 feet deep on the upper side to get it 15 inches on the lower one; but, apart from all calculation in the matter, my pits, ever since they were made, have been standing full of water, with the result that if a mouse gets in, it just swims across and out at the other side.

2. Cats have been tried on Langshawburn, but I am told with very poor success, while a man who is working there with terriers, I believe, reports that he has killed 32,000 in five weeks.

3. Traps.—They are no use.

4. Poison.—The risk in using this is that you might not only poison the sheep, but also the natural enemies of the mice, as well as the shepherds' dogs, thus making the cure as bad as the disease.

5. Burning might do something to help, but for obvious reasons you cannot burn the whole of the ground in one season; but should it be tried, I would suggest the same plan that I did to Mr Elliott Lockhart last spring, that leave should be obtained to burn after the young grass has fairly got a head, and then only the patches where the old withered grass appears and shows that the vermin are undermining it, and then each patch should be kindled on all sides at once, and so surround the mice. I am told that if they get the least scorch they will die.

I think I have given you my ideas on the subject as far as I can in the limits of a letter; but lest my report should be considered as a partial one, being in the infested district (and that for the second time), I would like to suggest that you, with one or two others of the Directors of the Highland and Agricultural Society (*practical men*), should come out and see for yourselves, and thus be able to report on the matter. I could put, say, three of you up for a night or couple of nights, when an impartial report from you would go far farther than anything I or any one feeling the scourge can either say or write, as we have hitherto been made a laughing-stock in the public prints. Should you think of taking a run out to look over the ground, I think you should be two nights here, so as to have one full clear day to see as much as possible. It would be easy for me to take you over some of the worst of the ground and show you a sample, but I do not think that is enough.

I have begun to learn all my sheep that have not heather (lea or moss) to eat cake, and have been giving part hay to the whole for some days past.

If any of the Directors should think of coming out, kindly give me a day or two of previous notice, or ask Mr Menzies to do so.—I am, yours very truly,

W. M. OLIVER.

MIDGEHOPE, 25th Jan. 1892.

DEAR SIR,—I have yours to hand about the mice plague, which is very serious in this neighbourhood, and unless some means are taken to destroy them immediately, they will take possession of everything in their reach. And the following answers to your questions to the best of my knowledge:—

The cause of their increase is due to the destruction of their natural enemies, such as hawks, owls, weasels, and crows. The amount of damage is very great, as at present every green blade is eaten up, and will cause farmers a large amount of expense to winter their stock. The time they appeared was in the summer of 1890. Their numbers are not increasing at present, as they don't breed during winter. We are killing large numbers of them at present with dogs, but I don't expect to exterminate them in that way. Landed proprietors should be petitioned to allow all their natural enemies to increase, so that they might be able to cope with their destruction; but I think Government should take up the matter immediately.—I remain, yours truly,  
HENRY SCOTT.

WALTER ELLIOT, Esq.

WALTER ELLIOT, Esq.

BRANXHOLM PARK, HAWICK, N.B.,  
23d Jan. 1892.

DEAR SIR,—I am in receipt of yours of 21st, and am glad to hear that the Highland and Agricultural Society is going to move in the matter of the mice plague.

I have much pleasure in answering your replies as far as I can:—

1. Cause of increase.—Chiefly the want of weasels, stoats, and ground vermin; also magpies and hawks. The shepherds say there is not a weasel or magpie to be seen.

2. The amount of damage.—On the farms where the plague is at its height half the sheep stock ought to be removed if other pasture could be got, and not brought back till May. Many men are doing this as far as they can.

3. The time they appeared.—The first time was about fifteen years ago, in the same district which is at present most affected—viz., Borthwickhead, Eskdalemuir, and Ettrick. They disappeared more suddenly than they came, and nobody can very well explain the reason. This present plague began about two years ago, and has increased more rapidly and over a much larger area, which is still extending.

4. The number is increasing very much; but just at present breeding has ceased.

5. Several methods have been tried, but men with spades and terriers is supposed to be the most effectual; but no amount of individual effort seems to make any perceptible difference.—Believe me, yours truly,  
CHARLES J. GRIEVE.

WALTER ELLIOT, Esq.

NEWTON, HAWICK, 25th Jan. 1892.

DEAR SIR,—I am in receipt of yours in reference to the mice plague.

1. The cause of their great increase.—I can give no cause.

2. The amount of damage.—Since we got the farm in 1887, we have never thought the lambs up to the quantity or quality they should have been, and more backgoing sheep than I could account for otherwise than by the mice hurting the ground. For the year 1890-91 the shortness of lambs, owing to the mice having the ground sore destroyed, £250.

For the year 1891-92—

Lightness of clip . . . . .	£31 0 0
410 sheep wintered away . . . . .	143 10 0
Grass taken to lamb 600 ewes on . . . . .	210 0 0
Hay grown on the farm, which the sheep are eating, which they would not require but for the mice . . . . .	160 0 0

But it is impossible to estimate the damage; and unless the mice depart soon, and the grass come again in the spring (what was eaten in 1890-91 has not grown again), the most of the sheep will be to take away and keep away till the mice plague gets past.

3. The time they appeared.—They have been on the farm since we took it in 1887; but never in such numbers to do very much harm till the autumn and winter of 1890-91.

4. Is their number increasing?—There seems to be a slight decrease in numbers.

5. The method, if any, you have adopted for destroying them, and any other information bearing on the matter in your power.—Tried cats, and have about 100.



Four shepherds and a hired man have fox terriers, and they kill from 400 to 600 each man per day when the weather will allow.

It is impossible for any one to believe the ground is so sore destroyed unless they see it. They have missed nothing, everything cropped to the earth. The future is a terrible looking to. I would be exceedingly pleased if you could spare a day to go out to Langshawburn and see it for yourself; it would not take us long; it is eighteen miles from Hawick. By letting me know, I would meet you at the 9 train, or any way more suitable to you.—Yours sincerely,  
JOHN SCOTT.

W. ELLIOT, Esq.

GAIR, 25th Jan. 1892.

DEAR SIR,—I am in receipt of your note of 21st, asking information about the mice plague. You have stated five questions for me to answer, which I will endeavour to do as correctly as possible.

1. You ask what I think the cause of their great increase is.—I think the cause is greatly due to the destroying of their natural enemies, the hawks, owls, and weasels, &c., which live mostly upon mice. The land round about here has been let to game-tenants for some years past—a thing that was never done before—therefore the game-watchers have destroyed all the natural enemies of the mice. That is the general opinion in this district of the great increase.

2. The amount of damage done by them.—It is not easy to calculate damage as yet, but it is very great; but I will give you some idea of the damage in 1891. Say a hirsol or farm of 600 sheep: the want of lambs was 25 per cent all round this district, some more, some less, and back in quality; therefore less money for them. Death of old sheep from 5 to 8 per cent. I would say on a farm of that size there would be £100 of loss in 1891—at least I can say that of my own. As for 1892, I can say nothing as yet; but it will be a great deal worse, as the stocks will all have to be fed extra, which will involve a cost of 5s. or 6s. a-head.

3. The time they appeared was in the month of February to any extent, and increased very fast after that—in fact, they just kept the grass almost down all the year after.

4. Is their number increasing?—No; they have not increased since the month of November: it seems that they don't breed in the winter months, and I think that they are not so numerous as they were.

5. The method of killing them.—I have tried different methods to destroy them: I tried pits, but found that was not practicable, as it took a great deal of work and cut up a great deal of land, and did not answer the end; dogs and sticks seems to be the best method that I have seen tried. One man, with a stick and a dog, is able to destroy five hundred in a day, and sometimes more; but that number is never missed, as they are in thousands. I don't think that I can give you any more information about them at present; but could you not come and see for yourself what the country is like? You could give a far better representation of the havoc that has been made by them.

I will be very glad to see you here and show you the ground, and give you all the information in my power.—I am, Sir, yours very truly,  
ALEX. LAIDLAW.

WALTER ELLIOT, Esq.

ANNELSHOPE, 26th Jan. 1892.

DEAR SIR,—I received yours of 21st about the mice, and give you the following answers to your questions as I have seen on this farm. They appeared earlier in greater quantities higher up about Tima Head. It is difficult to state the amount of damage done. The bog and benty bog is useless, and they are getting fast through with the lea. I believe if some bait could be got to attract them into the old kind of mouse-traps it would be more effective than dogs.

A number of the farmers round here are thinking of advertising for weasels, which we think are most likely to put them down if we can get them in quantity.

I hope the Board of Agriculture may take the matter up, but there is short time now till they will begin breeding again, when it will be more difficult to get the better of them.

1. The cause of their great increase.—The scarcity of enemies to keep them down. There are very few weasels: we rarely see one or their track in the snow. Hawks and owls are not plentiful.

2. Amount of damage.—It is not possible to state the exact amount of damage, but am safe when stating that half the farm is worthless in the meantime, and the other half much damaged.

3. The time they appeared.—I noticed them more plentiful than usual in the autumn 1890 and last spring, but it was last summer when the great increase was.

4. Is their number increasing?—I don't think they have been increasing since the month of September or October.

5. The method, if any, you have adopted for destroying them.—I tried pits, but was not very successful; got a number when in wet land, or after heavy rain when there was water in the bottom. Have tried several kinds of traps, but either failed to deceive them or had a want of attractive bait. Have killed most with dogs, with which they might be thinned, but it will require something more effectual than dogs or anything yet tried to put them down.—I am, yours truly,  
WM. BYRDON.

WEST BUCOLEUCH, SELKIRK, *Jan. 28, 1892.*

DEAR SIR,—In reply to yours of 21st inst. in regard to the mice:—

1. The cause of the great increase of the mice is, I believe, the destruction of the weasels, hawks, &c.; and in proof of this, three years ago, when there were no signs of this plague, the shootings here and on a few more adjoining farms were let to an English shooting-tenant, who at once put on keepers, one of whom lodged with a shepherd on my farm, and in a short time he trapped upwards of one hundred weasels, also a number of hawks, &c., and in the course of next season the mice began to appear.

2. The damage done is so extensive that although I have nearly the half of the sheep stock removed from the farm, I do not see how the other half can subsist on the land until the grass comes.

3. They began to appear as a plague about eighteen months ago, and the damage done last spring was very great, so much so that the sales of sheep from this farm were considerably affected on account of the want of condition of the stock.

4. They are not increasing at present, as it is not the breeding season.

5. We have been killing them with sticks and dogs, and we have killed, within the last three months, upwards of 13,000,—previous to that we did not keep count of them, —and this does not seem to affect their numbers.—I am, yours truly,  
JAMES GRIEVE.

WALTER ELLIOT, Esq., Hollybush.

WALTER ELLIOT, Esq.

MILSINGTON, *26th Jan. 1892.*

DEAR SIR,—I have yours of 21st, and will be very glad indeed to give you all the information in my power, regarding the plague of mice or voles, by answering your questions.

1. The cause of the great increase, I think, is due to the over-destruction of their natural enemies—weasels, owls, and hawks. From observation and inquiry, there is scarcely a weasel to be seen in this part of the country. If possible, they should be imported and strictly preserved. Owls and hawks are much more numerous lately—seem to have been drawn by the increase of food; but the mice getting to such an extent will take a long time before they stop them. They began on the range of hills from Teviot to Ettrick, separating Roxburgh and Selkirk shires from Dumfriesshire (the same as some sixteen years ago), where there is almost no plantation to harbour these birds of prey.

2. The amount of damage.—Thus far the damage is greatest on farms with a large proportion of bog-land, which they prefer. When it gets done they spread to bare lea, and heathery land also. Some farms in this district are so much damaged, there is not grass left to winter more than half the stock. If the mice were exterminated now, much of the land will be very poor pasture the first season. Some farmers have taken stock off the land; others feeding with hay, &c. They are attacking young plantations, peeling the bark off the trees.

3. The time they appeared.—They have been on the increase for three summers; not easily seen until they get pretty thick; began to show more in the autumn of 1890, and have spread rapidly since.

4. Is their number increasing?—They increased fearfully fast through summer; are stopped breeding meantime; have seen no young since October.

5. The method of destroying them.—Men and dogs are the most effectual means of killing I have seen tried. My farm is very heathery, and is almost impossible to get at them in it. Killed great numbers in my corn-fields during harvest; fear they will take the seed this time, especially on lea. They get cover between the furrows. Some gamekeepers are trying to put the blame on farmers for not burning more of their hills, which I think absurd. There is as much burnt as formerly, and some that were severely burnt are equally as bad, and it is only bent that should be burnt; no one would think of burning strong bogs. Landlords should stop their keepers and those of their shooting-tenants from killing these natural enemies (what they call vermin), and give them a trial.

The common crow picked out the nests, and I think would kill lots of the young mice.—I am, yours truly,  
CHARLES SCOTT.

DUMFEDLING, Jan. 29, 1892.

DEAR SIR,—I am favoured with yours of 21st, and am glad the Highland and Agricultural Society have taken up the question of serious damage done by mice on hill-farms in this and other districts. The following answers to your questions are given as far as I am able to do so, and hope they may be of some use.

Any other information you may desire I will gladly give.

1. The great increase is to be attributed to the almost unprecedented roughness of the ground in the summer of 1890, by which means abundant facilities for breeding was afforded, and obscurity from their natural enemies secured.

2. It is impossible to estimate the damage until the lambing season is over; but in the meantime the *whole* of the winter grasses (heather excepted) are nibbled at the roots, and the roughness on the surface is destitute of nourishment, and, as a consequence, sheep are getting lower in condition even under the best of weather.

3. The time they appeared in greatest numbers was the spring of 1891 and following summer.

4. Their number at present is not increasing. I have tried killing them with men and dogs, but find it impossible to exterminate them; all the killing that has been done does not seem to lessen their number to any noticeable extent.

There will have to be very large reductions of rent in the first instance; and if the mice remain with us, then pastoral farming is done.—I am, yours truly,

THOS. BEATTIE.

WALTER ELLIOT, Esq., Hollybush.

CRAICK, Jan. 30, 1892.

DEAR SIR,—Yours to hand. Would have answered sooner, but have been from home.

Regarding your questions about the mice plague, I may first say they are much worse than they were fifteen years ago.

*Answers to questions.*—1. The destruction of the balance of nature, owing to their natural enemies having been killed.

2. The *whole* of my farm totally destroyed.

3. About lambing-time 1891.

4. They are not increasing just now, not being their breeding-time; but there is no perceptible diminution in their numbers.

5. The shepherds, with sticks and their dogs.

I may say I have killed 100 in one hour; but do what we can, they are too numerous to cope with.—I am, yours truly,

JAMES MOFFAT.

LYNNWOOD, 1st Feb. 1892.

DEAR SIR,—I had your letter of 21st January, which I should have answered sooner, but press of work just now has caused me to put off. In answer to your questions, I have to state—

1. In my opinion, the cause of the great increase of the mice was the extraordinary growthy season of 1890, when there was such an amount of roughness on the hills, which not only afforded food but shelter both from weather and their natural enemies, combined with the destruction by gamekeepers of weasels, hawks, owls, &c.—which destruction, I may say, was carried on to the greatest extent upon farms which were in the hands of shooting-tenants.

2. It is not easy to say what is the amount of damage; but upon the farm of Glenkerry, in Tima Water, the ground is entirely destroyed—the good land as well as the bad, low-lying as well as high. One-third of the stock of sheep upon that farm is removed from the ground already, and the remainder I intend to feed through the spring months with Indian corn without removing them. Upon mice-infected farms the grass will be late in coming this season; and the crop of grass will not be plentiful, owing to the roots being destroyed.

3. I think the mice appeared to be numerous, and to cause alarm, during the summer of 1890.

4. The numbers are not increasing at present, as it is not the breeding season: that begins in March or April. But the creatures at this season, owing to their numbers, are spreading themselves over a larger area, and are spreading in all directions round and round the infected district. The reason of this is, that, upon land where they have been so numerous, the land will not sustain them longer, and has become foul, and they are compelled to seek fresh ground.

5. I had a man killing for a month on Glenkerry, and he would in that time kill upwards of 15,000. He had two collie dogs, and used a common spade himself. Sticks are of no use, as you cannot hit them. You require a flat thing like a spade, and then

you are surer. Killing, however, is of little avail and never seems to make them appear any fewer. Unless every farmer did it simultaneously, it would do little good; for if killed out upon one farm, they would just come to it again from another.—I am, yours very truly,

JOHN OLIVER.

WALTER ELLIOT, Esq., Hollybush.

*The above information has been collected at the request of the Highland and Agricultural Society for the use of the Board of Agriculture.*

F. N. MENZIES, *Secretary.*

5th Feb. 1892.

# LETTER FROM BOARD OF AGRICULTURE REFERRING TO ABOVE LETTERS.

BOARD OF AGRICULTURE,  
4 WHITEHALL PLACE, S.W.,  
8th March 1892.

DEAR SIR,—With reference to the series of interesting letters on the plague of mice in the South of Scotland, which you were good enough to forward, on the 6th of February last, for the information of this Board, will you kindly say if you desire to add any further information which may have reached your office since that date? I may state that the Board have under consideration the propriety of printing the Reports they have had made to them on the matter, and propose to append the letters printed by the Highland and Agricultural Society.

Perhaps you would kindly let me know, by wire to-morrow, if you see any objection to this course, or desire to suggest waiting for any further particulars.—Yours very faithfully,

P. G. CRAIGIE.

The SECRETARY,  
Highland and Agricultural Society,  
Edinburgh.

# PREMIUMS AWARDED BY THE SOCIETY IN 1891.

## PREMIUMS AWARDED BY THE SOCIETY IN 1891.

### I.—REPORTS.

1. Thomas Dykes, Bent Farm, Lesmahagow, for a Report on permanent Timothy-grass Meadows . . . . .	£10 0 0
2. T. W. Lorimer, Newton Stewart, for a Report on a practical and reliable method of adjusting Farm Rents in accordance with fluctuations in the Prices of Farm Produce . . . . .	10 0 0
3. John Blaikie Webster, Fair View, Dungannon, Ireland, for a Report on Pasture Plants . . . . .	10 0 0
4. Robt. Hutchison, Barnhill, Brodick, Arran, for a Report on the old and remarkable Hollies in Scotland . . . . .	5 0 0
5. John Barclay, Cowfords, Banff, for a Report on the Chilled Plow . . . . .	5 0 0
	<hr/> £40 0 0

### II.—STIRLING SHOW, 1891.

ABBREVIATIONS.—V. H. C., *Very Highly Commended*. H. C., *Highly Commended*. C., *Commended*.

#### CLASS I.—CATTLE.

##### SHORTHORN.

THE TWEEDDALE GOLD MEDAL. *Best Shorthorn Bull* in the Yard.

David C. Bruce, Broadland, Huntly, "Cock o' the North" (57,072) . . . £18 5 8

*Breeder of Best Bull*. Geo. Roberts, Fetterletter, Fyvie Silver Medal 0 14 0

##### SECTION 1. BULL, calved before 1st January 1889.

1. D. C. Bruce, Broadland, Huntly, "Cock o' the North" (57,072) . . . . .	20 0 0
2. R. Thomson, Inglewood, Penrith, "Merry Beau" (56,180) . . . . .	10 0 0
3. A. M. Gordon of Newton, Inch, "Star of Morning" (58,189) . . . . .	5 0 0
V. H. C.—John Provan, Drum of Kinnaird, Larbert, "St Patrick." . . . .	
H. C.—J. G. Main, Burns, Portsoy, "Royal Blossom" (58,033) . . . . .	
C.—A. Robertson, Haugh of Ballechin, Ballinluig, "Dauntless" (54,155) . . . . .	

##### SECTION 2. BULL, calved on or after 1st January 1889.

1. James Leith, Glengerrack Mains, Keith, "Mario" (59,438) . . . . .	15 0 0
2. William T. Malcolm, Dunmore Home Farm, Larbert, "Abbot" . . . . .	10 0 0
3. Robert Thompson, Inglewood, Penrith, "British Beau" (58,560) . . . . .	5 0 0
V. H. C.—John Smith, Balmain, Fettercairn, "British Leader." . . . .	
C.—The Earl of Rosebery, Dalmeny Park, Edinburgh, "Strowan Marquis." . . . .	

##### SECTION 3. BULL, calved on or after 1st January 1890.

1. John Gilmour of Montrave, Leven, "Excelsior" . . . . .	12 0 0
2. J. G. Main, Burns, Portsoy, "Nairn" . . . . .	8 0 0
3. William Smith, Shenwell, Keith, "Marmaduke" . . . . .	4 0 0
H. C.—James M'William, Stoneytown, Keith, "Evander." C.—James Douglas Fletcher of Rosehaugh, Inverness, "Prince Alfred." . . . .	

Carry forward . . . £107 19 8

Brought forward . . . £107 19 8

## SECTION 4. COW, of any Age.

1. Lord Polwarth, Mertoun House, St Boswells, "Truth" . . .	12	0	0
2. William Graham, Eden Grove, Penrith, "Windsor's Beauty" . . .	8	0	0
3. A. M. Gordon of Newton, Inch, "Marietta" . . .	4	0	0
V. H. C.—H. F. Rose of Holme Rose, Fort George Station, "Florence 12th." H. C.—W. T. Malcolm, Dunmore Home Farm, Larbert, "Rolla 5th." C.—James Scott, Softlaw East Mains, Kelso, "Catharine Seyton."			

## SECTION 5. HEIFER, calved on or after 1st January 1889.

1. Lord Polwarth, Mertoun House, St Boswells, "Gladstone Wave" . . .	10	0	0
2. James M'William, Stoneytown, Keith, "Golden Gift" . . .	5	0	0
3. Lord Polwarth, Mertoun House, St Boswells, "Patience Lyndhurst" . . .	3	0	0
H. C.—T. J. Graham Stirling of Strowan, Crieff, "Strowan Buttercup 3d."			

## SECTION 6. HEIFER, calved on or after 1st January 1890.

1. James M'William, Stoneytown, Keith, "Golden Gem" . . .	10	0	0
2. J. D. Fletcher of Rosehaugh, Inverness, "Merry Duchess" . . .	5	0	0
3. Lord Polwarth, Mertoun House, "Telluria Casket" . . .	3	0	0
V. H. C.—Lord Polwarth, Mertoun House, "Rosamund Foggathorpe." H. C.—John Smith, Balmain, Fettercairn, "Royal Rose." C.—The Earl of Rosebery, Dalmeny Park, Edinburgh, "Roan Duchess 2d."			

## AYRSHIRE.

<i>Breeder of Best Bull.</i> Robert Montgomerie, Lessnessock, Ochiltree, "Dreadnaught" . . . Silver Medal	0	14	0
---	---	----	---

## SECTION 7. BULL, calved before 1st January 1889.

1. James Wilson, Westburn Farm, Cambuslang, "Lord Glencairn" (1818) . . .	15	0	0
2. Richard Shanks, Braehead, Cumbernauld, "Laird of Cockpen" . . .	10	0	0
3. Alexander Craig, Over Milton, East Kilbride, "Duncan Gray" . . .	5	0	0

## SECTION 8. BULL, calved on or after 1st January 1889.

1. Robert Montgomerie, Lessnessock, Ochiltree, "Dreadnaught" . . .	12	0	0
2. Mark J. Stewart of Southwick, M.P., Dumfries, "Blooming Heather" (1918) . . .	8	0	0
3. Walter Paul, Laighpark, Milngavie, "Uncle Joe of Adamhill" (1934) . . .	5	0	0
V. H. C.—Mark J. Stewart of Southwick, M.P., "Hover of Southwick." H. C.—Andrew Allan, Munnoch, Dalry, "Hard Cash." C.—James M'Farlane, Oxhill, Bucklyvie, "Baron 2d of Oxhill."			

## SECTION 9. BULL, calved on or after 1st January 1890.

1. Robert Osborne, Drumjoan, Ochiltree, "Cockie Leekie" . . .	8	0	0
2. Robert Wardrop, Garlaff, Cumnock, "Flynn Again" . . .	5	0	0
3. Robert Wardrop, Garlaff, Cumnock, "Duke of Cumnock" . . .	3	0	0
V. H. C.—Thomas Lindsay, Reidston, Ochiltree, "Clear the Way." H. C.—Hugh Drummond, Craighead, Mauchline, "Duke of Wellington." C.—John M'Kean, Ballewan, Strathblane, "Sir William."			

## SECTION 10. COW (in Milk) of any Age.

1. James Lawrie, West Newton, Strathaven, "Sonsie" . . .	12	0	0
2. Alexander Steel, Burnhead, Darvel, "Sloth 2d" . . .	8	0	0
3. John Holm, Japston, Neilston, N.B., "Dandy 2d" (6302) . . .	4	0	0
V. H. C.—John Holm, Japston, Neilston, N.B., "London." H. C.—Hugh Duncan, Langelochrad, Rothesay, "Snowdrop." C.—W. E. Gilmour, Woodbank, Alexandria, N.B., "Lady Inches, No. 3."			

Carry forward . . . £263 13 8

Brought forward . . . £263 13 8

SECTION 11. COW (in Calf) of any Age.

1. Robert Wilson, Manswraes, Bridge of Weir, "Whitie" . . .	10 0 0
2. John Stewart, 128 Bellfield Street, Glasgow, "Beauty" . . .	7 0 0
3. Andrew Allan, Munnoch, Dalry, Ayrshire, "Lottery 2d" . . .	3 0 0
H. C.—James Risk, Drumbrae, Bridge of Allan, "Byna." C.—William Crawford, Lugtonridge, Beith, Ayrshire.	

SECTION 12. HEIFER, calved on or after 1st January 1889.

1. Robert Osborne, Drumjoan, Ochiltree, "Gentle Annie" . . .	10 0 0
2. Hugh Drummond, Craighead, Mauchline, "Bloomer 3d" . . .	5 0 0
3. Robert Wardrop, Garlaiff, Cumnock, "Jemima" . . .	3 0 0
V. H. C.—Thomas Lindsay, Reidston, Ochiltree, "Heather Bell." H. C.—Andrew Allan, Munnoch, Dalry, "Rhoda 2d." C.—Robert Montgomerie, Lessnessock, Ochiltree, "Bright Eyes."	

SECTION 13. HEIFER, calved on or after 1st January 1890.

1. Andrew Mitchell, Barcheskie, Kirkcudbright, "Queen Mary" . . .	8 0 0
2. Robert Osborne, Drumjoan, Ochiltree, "Choice Goods" . . .	5 0 0
3. Andrew Allan, Munnoch, Dalry, Ayrshire . . .	3 0 0
V. H. C.—Hugh Drummond, Craighead, Mauchline, "Dewdrop 5th." H. C.—Robert Wardrop, Garlaiff, Cumnock, "La Russe." C.—Mark J. Stewart of Southwick, M.P., "Betty 3d of Southwick."	

ABERDEEN-ANGUS.

<i>Breeder of Best Bull.</i> —Sir George Macpherson Grant, Bart., The Castle, Ballindalloch, "Epsom" (7507) . . . Silver Medal	0 14 0
--	--------

SECTION 14. BULL, calved before 1st December 1888.

1. D. C. Bruce, Byres Farm, Fochabers, "Fitz Lyon" (6056) . . .	20 0 0
2. Earl of Airlie, Cortachy Castle, "Rover of Powrie" (4991) . . .	10 0 0
3. Earl of Strathmore, Glamis Castle, "Figaro" (6728) . . .	5 0 0

SECTION 15. BULL, calved on or after 1st December 1888.

1. Arthur Egginton, South Ella, Hull, "Epsom" (7507) . . .	15 0 0
2. Sir George Macpherson Grant, Bart., Ballindalloch, "Prince Inca" (7844) . . .	10 0 0
3. J. T. Cathcart, yr. of Pitcairnie, Newburgh, "Julius Cæsar" (7637) . . .	5 0 0
V. H. C.—William Whyte, Spott, Kirriemuir, "Jolly Rover" (7633).	

SECTION 16. BULL, calved on or after 1st December 1889.

1. John Stuart, Stone Hurst, Ardingly, Sussex, "Financier of Ballindalloch" (8328) . . .	12 0 0
2. The Queen, Abergeldie Mains, Ballater, "Baron Aboyne" (8087) . . .	8 0 0
3. John Grant, Advie Mains, Advie, "Rustler" (8761) . . .	4 0 0
V. H. C.—Miss Morison Duncan of Naughton, Newport, "Equal" (8294). H. C.—Marquis of Huntly, Aboyne Castle, "Baron of Coull."	

SECTION 17. COW, calved before 1st December 1887.

1. Marquis of Huntly, Aboyne Castle, "St Agnes" (13,839) . . .	12 0 0
2. The Queen, Abergeldie Mains, "Miss Pretty" (12,813) . . .	8 0 0
3. James Reid, Greystone, Alford, "Annabella 6th of Asloun" (14,112) . . .	4 0 0

SECTION 18. COW, three years old. Given by Mr Macpherson Grant of Drumduan.

1. Marquis of Huntly, Aboyne Castle, "St Agatha" (13,838) . . .	12 0 0
2. Earl of Strathmore, Glamis Castle, "Spiraea 3d of Clinterty" (12,843) . . .	8 0 0
3. Sir George Macpherson Grant, Bart., Ballindalloch, "Eurya" (13,708) . . .	4 0 0
V. H. C.—James Reid, Greystone, Alford, "Jane of Greystone 3d."	

Carry forward . . . £455 7 8

Brought forward . . . £455 7 8

SECTION 19. HEIFER, calved on or after 1st Dec. 1888.

1. Marquis of Huntly, Aboyne Castle, "Lady Aboyne" (15,204)	10	0	0
2. Earl of Strathmore, Glamis Castle, "Penitence" (15,723)	5	0	0
3. Lord Tweedmouth, Guisachan, Beauly, N.B., "Grizel" (15,751)	3	0	0
V. H. C.—Sir G. Macpherson Grant, Bart., Ballindalloch, "Ruthven Rose" (15,061). H. C.—The Queen, Abergeldie Mains, "Princess Irene 2d" (15,861). C.—Miss Morison Duncan of Naughton, "Pride of Tay" (14,854). William Whyte, Spott, Kirriemuir, "Barmaid 5th of Benholm" (15,644).			

SECTION 20. HEIFER, calved on or after 1st Dec. 1889.

1. Lord Tweedmouth, Guisachan, Beauly, N.B., "Pride of Guisachan 34th" (17,300)	10	0	0
2. D. C. Bruce, Byres Farm, Fochabers, "Budding Bloom"	5	0	0
3. Earl of Airlie, Cortachy Castle, "Marjory of Cortachy" (15,898)	3	0	0
V. H. C.—Sir George Macpherson Grant, Bart., Ballindalloch, "Rose of the Vicarage" (16,508). H. C.—D. C. Bruce, Byres Farm, "Imperial Purple" (16,060). Earl of Strathmore, Glamis Castle, "Vignette" (17,268). C.—Lord Tweedmouth, Guisachan, "Pride of Guisachan 35th" (17,301). Earl of Airlie, Cortachy Castle, "Nemesis" (15,901). Sir George Macpherson Grant, Bart., "Eurelia" (16,493). The Queen, Abergeldie Mains, "Pretty Peggy."			

GALLOWAY.

<i>Breeder of Best Bull.</i> —James Cunningham, Tarbreoch, Dalbeattie, "Maddougall" (4436)	Silver Medal	0	14	0
--	--------------	---	----	---

SECTION 21. BULL, calved before 1st January 1889.

1. Duke of Buccleuch and Queensberry, K.T., Drumlanrig Castle, Thornhill, "Maddougall" (4436)	20	0	0
2. R. & J. Shennan, Balig, Kirkcudbright, "Crown Jewel" (4853)	10	0	0
3. J. Jardine Paterson of Balgray, Lockerbie, "Macleod 3d of Balgray" (4646)	5	0	0

SECTION 22. BULL, calved on or after 1st January 1889.

1. Thomas Biggar & Sons, Chapelton, Dalbeattie, "Viking" (5021)	15	0	0
2. Sir Robert Jardine of Castlemilk, Bart., M.P., Lockerbie, "Black Douglas of Castlemilk" (5002)	10	0	0
3. James Cunningham, Tarbreoch, Dalbeattie, "Cedric of Tarbreoch" (5060)	5	0	0
V. H. C.—George Graham, Oakbank, Longtown, "Trojan of Castlemilk" (4498).			

SECTION 23. BULL, calved on or after 1st January 1890.

1. J. Jardine Paterson of Balgray, "Scottish Knight of Tarbreoch" (5300)	12	0	0
2. Robert T. Scott, Drumhughphry, Corsöck, "Scottish Hero of Tarbreoch" (5300)	8	0	0
3. Sir Robert Jardine of Castlemilk, Bart., M.P., "Monitor 2d of Castlemilk" (5269)	4	0	0
V. H. C.—H. G. Murray Stewart of Cally, Gatehouse, N.B., "Triumph 2d of Drumlanrig" (5264). H. C.—Hon. Charles Hope, St Mary's Isle, Kirkcudbright, "Crown Jewel 2d" (5303). C.—Lord Polwarth, Mertoun, St Boswells, "Bonnie Champion" (5437).			

SECTION 24. COW, of any Age.

1. The Countess of Carlisle, Naworth Castle, Brampton, Cumberland, "Vaudeville 2d of Closeburn" (8134)	12	0	0
2. Duke of Buccleuch and Queensberry, K.T., "Pride 4th of Drumlanrig" (10,337)	8	0	0

Carry forward . . . £601 1 8



	Brought forward	£601	1	8
3. James Cunningham, Tarbreoch, "Madonna 2d of Tarbreoch" (11,056)		4	0	0
V. H. C.—James Cunningham, Tarbreoch, "Fan 4th of Airds" (9350).				
H. C.—James Cunningham, Tarbreoch, "Lady Stanley 10th" (5425).				
C.—The Countess of Carlisle, "Vendetta 2d of Closeburn" (10,4)				

## SECTION 25. HEIFER, calved on or after 1st January 1889.

1. James Cunningham, Tarbreoch, "Scottish Queen" (11,524)	10	0	0
2. James Cunningham, Tarbreoch, "Madonna 3d" (11,532)	5	0	0
3. Sir Robert Jardine of Castlemilk, Bart., M.P., "Jenny Duke 5th" (11,499)	3	0	0
V. H. C.—Duke of Buccleuch and Queensberry, K.T., "Bellona 5th" (11,463).			
H. C.—Duke of Buccleuch and Queensberry, K.T., "Atalanta 2d" (11,453).			
C.—James Cunningham, Tarbreoch, "Mary Graham" (11,595).			

## SECTION 26. HEIFER, calved on or after 1st January 1890.

1. Duke of Buccleuch and Queensberry, K.T., "Tidy 5th" (11,933)	10	0	0
2. H. G. Murray Stewart of Cally, "Maggie of Cally" (12,316)	5	0	0
3. Sir Robert Jardine, Bart., M.P., Lanrick Castle, Doune, "Lady Agnes 3d" (11,981)	3	0	0
V. H. C.—Duke of Buccleuch and Queensberry, K.T., "Fair Queen 2d" (11,931).			
R. & J. Shennan, Balig, Kirkcudbright, "Jenny Jewel 2d" (12,111).			
H. C.—Sir Robert Jardine of Castlemilk, Bart., M.P., "Lady Tidy 3d" (11,962).			
C.—Sir Robert Jardine, Bart., M.P., Lanrick Castle, "Scotch Pearl 5th" (11,979).			

## HIGHLAND.

<i>Best Bull.</i> Given by Mr Smith of Ardtornish—John Stewart of Ensay, Obbe, "Ceatharnach Buidhe" (719)	10	0	0
<i>Best Female.</i> Given by Mr Smith of Ardtornish.—Thomas Valentine Smith of Ardtornish, Morvern, Oban, "Sgiathach 4th"	10	0	0
<i>Breeder of Best Bull.</i> —John Stewart of Ensay, Obbe, "Ceatharnach Buidhe"	0	14	0
			Silver Medal

## SECTION 27. BULL, calved before 1st January 1889.

1. John Stewart of Ensay, Obbe, "An-t-Aileagan" (703)	20	0	0
2. John Malcolm of Poltalloch, Lochgilphead, "Tearlach Ruadh" (698)	10	0	0
3. John Stewart of Ensay, Obbe, "Scarbhaidh" (814)	5	0	0
V. H. C.—Earl of Southesk, K.T., Kinnaird Castle, Brechin, "Iain Challum" (667).			
H. C.—John M'Phail, Scallastle, Craignure, Mull, "Am Mhùileach."			
C.—Lord Willoughby de Eresby, Glenarty Forest, Comrie, "Prince George."			

## SECTION 28. BULL, calved on or after 1st January 1889.

1. John Stewart of Ensay, "Ceatharnach Buidhe" (719)	15	0	0
2. Duke of Athole, K.T., Blair Castle, "Donull Riabhach"	10	0	0
3. T. V. Smith of Ardtornish, "Victor 4th"	5	0	0
V. H. C.—John Stewart, Bochastle, Callander, "Donnacha Buidhe."			
H. C.—Robert Stewart of Kinlochmoidart, Moidart, "Rob of Kinlochmoidart."			
C.—Sir John Campbell Orde of Kilmory, Bart., Lochgilphead, "Clan Alpine."			

## SECTION 29. BULL, calved on or after 1st January 1890.

1. Evan M. Macrae, Mains of Kinbeachie, Conon Bridge, "An Gaisgeach"	12	0	0
2. John Campbell of Kilberry, Argyllshire, "Bhaltair"	8	0	0
3. T. V. Smith of Ardtornish, Morvern, "Valentine 4th"	4	0	0
V. H. C.—T. V. Smith of Ardtornish, "Victor 6th."			
H. C.—Duke of Athole, K.T., Blair Castle.			
C.—John Malcolm of Poltalloch, "Crinan Buidhe."			

Carry forward . . . £750 15 8

Brought forward . . . £750 15 8

## SECTION 30. COW, of any Age.

1. John Malcolm of Paltalloch, Lochgilphead, "Ealasaid" (1128)	12	0	0
2. J. Campbell of Kilberry, Argyllshire, "Baravalla" (932)	8	0	0
3. John Stewart, Bochartle, Callendar, "Proiseag Riabhach"	4	0	0
V. H. C.—Duke of Athole, K.T., Blair Castle, "Bean O'g 3d" (1875).			
H. C.—John Malcolm of Paltalloch, "Proiseag 4th" (1576). C.—			
Earl of Southesk, K.T., Kinnaired Castle, "Delia Emily" (1259).			

## SECTION 31. HEIFER, calved on or after 1st January 1888.

1. John Stewart of Bochartle, Callendar, "Mairi Bhuidhe"	10	0	0
2. John Stewart of Bochartle, "Proiseag Bhuidhe 3d" (1811)	5	0	0
3. T. V. Smith of Ardtornish, Morvern, Oban, "Clementina 3d" (1711)	3	0	0
V. H. C.—John Malcolm of Paltalloch, "Ealasaid O'g." H. C.—Duke			
of Athole, K.T., Blair Castle, "Beauty 2d." C.—Duke of Athole,			
K.T., "Annag Riabhach 1st."			

## SECTION 32. HEIFER, calved on or after 1st January 1889.

1. T. V. Smith of Ardtornish, Morvern, "Sgiathach 4th"	10	0	0
2. Duke of Sutherland, K.G., Achadaphris Farm, Lairg, N.B.,			
"Duchess"	5	0	0
3. James Carnegie of Stronvar, Lochearnhead, "Dubh Mairi"	3	0	0
V. H. C.—T. V. Smith of Ardtornish, "Sgiathach 5th." H. C.—Sir			
John Campbell Orde of Kilmoiry, Bart., "Ealasaid." C.—John			
Malcolm of Paltalloch, "Proiseag Riabhach."			

## EXTRA CATTLE.

## Very Highly Commended.

James Leith, Glengerrack Mains, Keith, Shorthorn Heifer, "Fair Maid"	5	0	0
Countess Dowager of Seafield, Castle Grant, Grantown, Highland Ox,			
"Donald" . . . . . Medium Gold Medal	5	10	0
Lady G. G. Osborne Elphinstone, Tullyallan, Kincardine-on-Forth, Jer-			
sey Bull, "Ben"	5	0	0
W. E. Gilmour, Woodbank, Alexandria, N.B., Jersey Cow "Lady			
Jessie" . . . . . Medium Gold Medal	5	10	0

## Highly Commended.

Peter M'Caull, Knockhill, Bridge of Allan, Aberdeen-Angus Ox.	3	0	0
Peter Mackie, East Kirkton, Auchterarder, Highland Ox			
Minor Gold Medal	3	6	0
Colonel John Ramage Dawson of Balado, Kinross, Cross Heifer, "May"	3	0	0
Lady William Osborne Elphinstone, Tullyallan, Kincardine-on-Forth,			
Jersey Cow, "Quality 3d"	3	0	0
W. E. Gilmour, Woodbank, Alexandria, N.B., Jersey Bull, "Tulli-			
chewan" . . . . . Minor Gold Medal	3	6	0

## Commended.

Peter Mackie, East Kirkton, Auchterarder, Highland Ox	Silver Medal	0	14	0
Peter M'Caull, Knockhill, Bridge of Allan, Aberdeen-Angus Ox	Silver Medal	0	14	0

£848 15 8

## CLASS II.—HORSES.

## FOR AGRICULTURAL PURPOSES.

Best Male, registered in Clydesdale Stud Book—Silver Medal, value			
£2, 10s., given by the Clydesdale Horse Society; also Prize of			
£10, 10s., given by Lord Polwarth, ex-President of the Clydesdale			
Horse Society.—Peter Crawford, Carruchan, Dumfries, "Prince of			
Carruchan" (8151) . . . . . (Silver Medal, £2, 10s.)	10	10	0

Carry forward . . . £10 10 0

Brought forward	£10 10 0
<i>Best Female</i> , registered in Clydesdale Stud Book—Silver Medal, value £2, 10s., given by the Clydesdale Horse Society; also Prize of £10, 10s., given by Lord Polwarth, ex-President of the Clydesdale Horse Society.—David Riddell, Blackhall, Paisley, "Sunrise." (Silver Medal, £2, 10s.)	10 10 0
<i>Breeder of Best Male</i> .—J. M'Craig, Challoch, Stranraer, "Prince of Carruchan" . . . . . Silver Medal	0 14 0

## SECTION 1. STALLION, foaled before 1st January 1888.

1. Peter Crawford, Carruchan, Dumfries, "Goldfinder" (6807)	20 0 0
2. Wm. Renwick, Meadowfield, Corstorphine, "Darnley's Last" (6663)	15 0 0
3. Matthew Marshall, Stranraer, "Johnnie's Style" (6867)	10 0 0
4. David Riddell, Blackhall, Paisley, "Conspiracy"	5 0 0
V. H. C.—Alexander Scott, Berry Yards Farm, Greenock, "Lord Montrose" (7973). H. C.—Peter Crawford, Carruchan, Dumfries, "Eastfield Prince" (6722). C.—Alexander M'Robbie, Sunnyside, Aberdeen, "Prince William" (6713).	

## SECTION 2. ENTIRE COLT, foaled on or after 1st January 1888.

1. Peter Crawford, Carruchan, Dumfries, "Prince of Carruchan" (8151)	15 0 0
2. George Bean, Balquhain Mains, Piteaple, "Mount Royal" (8065)	12 0 0
3. William Hood, Chapelton, Borgue, Kirkcudbright, "Prince Romeo" (8144)	8 0 0
4. Peter Crawford, Carruchan, "Lawrence Again" (7909)	4 0 0
V. H. C.—Hugh Andrew, Lennoxlove Acredales, Haddington, "Prince Ethelbert" (8135). H. C.—William Graham, Eden Grove, Peurith, "MacCash" (7997). C.—Messrs Barr, Valleyfield, Ringford, Castle-Douglas, "Fergusson."	

## SECTION 3. ENTIRE COLT, foaled on or after 1st January 1889.

1. R. & J. M'Alister, Mid Ascoig, Rothesay, "Rosemount" (8953)	15 0 0
2. Andrew Montgomery of Nether Hall, Castle-Douglas, "Prince Patrick" (8933)	10 0 0
3. Peter Crawford, Carruchan, Dumfries, "Crown and Feather" (8559)	6 0 0
4. James A. Wallace, Claycrop, Kirkcinner, "Prince of Princes" (9088)	3 0 0
V. H. C.—David Riddell, Blackhall, Paisley. H. C.—Peter Crawford, Carruchan, "Cash" (8517). C.—Hugh Andrew, Lennoxlove Acredales, "Shaw-Stuart" (8986). Patrick Stirling of Kippendavie, "Glenalbyn."	

## SECTION 4. ENTIRE COLT, foaled on or after 1st January 1890.

1. George Alston, Loudon Hill, Darvel, "Kyle 2d"	12 0 0
2. J. A. Wallace, Claycrop, Kirkcinner, "Duke of Rothesay"	7 0 0
3. George Shepherd, Shethin, Tarves, "M'Canon's Erskine"	4 0 0
4. Peter Crawford, Carruchan, Dumfries	2 0 0
V. H. C.—W. H. Lumsden of Balmedie, Aberdeen, "Balmedie Masterpiece." H. C.—Earl of Strathmore, Glamis Castle, Glamis, "Life Guard." C.—Robert Spittal, Kennmuir, Tollcross, Glasgow. Sir J. A. Hay of Haystoun, Bart., Kingsmeadows, Peebles.	

## SECTION 5. MARE of any age (with Foal at foot).

1. David Riddell, Blackhall, Paisley, "Sunrise"	20 0 0
2. Duke of Buccleuch and Queensberry, K.T., Drumlaurig Castle, Thornhill, "Handsome Jess"	10 0 0
3. Earl Cawdor, Cawdor Castle, Nairn, "Lady Lawrence" (9476)	5 0 0
4. Edward Balfour, yr. of Balbirnie, Markinch, "Miss Alice" (8069)	3 0 0
V. H. C.—Lord Polwarth, Mertoun, St Boswells, "Comfort." H. C.—Patrick Stirling of Kippendavie, "Heroine." C.—Duke of Buccleuch and Queensberry, K.T., "Young Duchess of Hamilton."	

Carry forward . . . £207 14 0

Brought forward . . . £207 14 0

SECTION 6. MARE (in Foal), foaled before 1st January 1888.

1. William Park, Brunstane, Portobello, "Polly" . . .	15 0 0
2. R. Sinclair Scott, Craigievar, Skelmorlie, "Scottish Rose" . . .	10 0 0
3. Sir J. A. Hay of Haystoun, Bart., Peebles, "Belinda" . . .	5 0 0
4. David M'Gibbon, Ardnacraig, Campbeltown, "Moy" . . .	3 0 0
V. H. C.—David M'Gibbon. H. C.—John Keith, Balgay, Dundee, "Lass of Balgay."	

SECTION 7. FILLY, foaled on or after 1st January 1888.

1. R. Sinclair Scott, Craigievar, Skelmorlie, "Scottish Snowdrop" . . .	10 0 0
2. George A. Baird, Strichen Mains, Strichen . . .	6 0 0
3. Patrick Stirling of Kippendavie, "Brenda of Kippendavie" . . .	3 0 0
4. James Patrick, Queenzieburn, Kilsyth, "Lady Jane" . . .	2 0 0
V. H. C.—Lord Polwarth, Mertoun House, St Boswells, "Conny Nairn."	

SECTION 8. FILLY, foaled on or after 1st January 1889.

1. James Lockhart, Mains of Airies, Stranraer, "Irene" . . .	10 0 0
2. Robert Murdoch, West Hallside, Newton, Glasgow, "Duchess II. of Girvan" (8486) . . .	6 0 0
3. John Gilmour of Montrave, Leven, "Montrave Maul" . . .	3 0 0
4. Matthew Marshall, Stranraer . . .	2 0 0
V. H. C.—James A. Wallace, Claycrop, Kirkcinner, "Mary Anderson." H. C.—William Watson, Ochterlony Mains, Guthrie, "Gipsy Maid." C.—Lord Polwarth, Mertoun House, "Miss Maggie," late "Maggie 4th." William Montgomery, Banks, Kirkcudbright, "Crosby Rose."	

SECTION 9. FILLY, foaled on or after 1st January 1890.

1. W. H. Lumsden of Balmedie, Aberdeen, "Balmedie Eucharistress" . . .	10 0 0
2. Andrew Mitchell, Barcheskie, Kirkcudbright, "Lady Muriel" . . .	6 0 0
3. Major L. D. G. Duff, Drummuir, Keith, "Queenie Flashwood" . . .	3 0 0
4. John Gilmour of Montrave, Leven, "Montrave Rosen" . . .	2 0 0
V. H. C.—William Pettigrew, Blackhall, Shotts, "Duchess of Argyll." H. C.—David Mitchell, Millfield, Polmont, "Maritana." C.— Richard Dunn, Udston Cottage Farm, Hamilton, "Sonsie Lass."	

SECTION 10. YEARLINGS the produce of the Queen's Premium Stallions that have served in Scotland, out of Mares of any breed. Given by Capt. Clayhills Henderson of Invergowrie, R.N.

1. Capt. Clayhills Henderson, R.N., Invergowrie, Gelding, "Mr Stanley" . . .	10 0 0
2. Lord Polwarth, Mertoun, St Boswells, Gelding, "Cash" . . .	7 0 0
3. Lord Polwarth, Mertoun, Filly, "Orange Blossom" . . .	5 0 0
4. Capt. Clayhills Henderson, R.N., Invergowrie, Gelding, "Royalist" . . .	2 0 0
5. H. V. Haig of Ranornie, Ladybank, Filly, "Queen of Scots" . . .	1 0 0

HUNTERS AND ROADSTERS.

SECTION 11. MARE or GELDING, suitable for Field, foaled before 1st January 1888.

1. John Gilmour of Montrave, Leven, Gelding, "Mikado" . . .	12 0 0
2. Thomas Richmond, Hilton, Perth, Gelding, "The Baron" . . .	8 0 0
3. William Birkmyre, Llanvair Lodge, Kilmalcolm, Gelding, "Macgregor" . . .	4 0 0
H. C.—W. E. Gilmour, Woodbank, Alexandria, Mare, "Minnie."	

SECTION 12. MARE or GELDING, suitable for Field, foaled on or after 1st January 1888.

1. Mrs Tennent, Glenouther, Stewarton, Gelding, "Mosshawk" . . .	12 0 0
2. Robert Brydon, The Dene, Seaham Harbour, Gelding, "Storm" . . .	8 0 0
3. George Pople, Newhouse, Perth, Gelding, "Prince" . . .	4 0 0
C.—David Pringle, Torquhan, Stow, Gelding, "Hereward."	

Carry forward . . . £376 14 0

Brought forward . . . £376 14 0

SECTION 13. MARE or GELDING, suitable for Field, foaled on or after 1st January 1889.

1. Robert Paterson of Birthwood Biggar, Gelding . . .	10	0	0
2. Hugh Patrickson, Kirkclinton Park, Carlisle, Gelding, "Sunlight" . . .	5	0	0
3. John C. Toppin, Musgrave Hall, Penrith, Gelding, "Banker" . . .	3	0	0
H. C.—J. D. Lumsden, Huntingtowerfield, Perth, Gelding, "Royalist."			

SECTION 14. MARE or GELDING, suitable as Hackney or Roadster, to be exhibited in Saddle only.

1. Hugh V. Haig of Ramornie, Ladybank, Gelding, "Hector" . . .	0	0	
2. Sir John Campbell Orde, Bart., Kilmory, Lochgilphead, Mare, "Jubilee" . . .	0	0	
3. Andrew Hunter, Braehead House, Cathcart, Mare, "Lady Mary" . . .	0	0	
C.—Alexander Scott, Berry Yards Farm, Greenock, Mare, "Merry Agnes."			

SECTION 15. MARE or GELDING, suitable for Driving, 3 years old and upwards, to be shown in Harness and Driven.

1. Andrew Hunter, Braehead House, Cathcart, Mare, "Moonlight" (1285) . . .	8	0	0
2. James Hepburn, Forth Bank, Kinghorn, Mare, "Lady Mary" . . .	4	0	0
3. Alexander Scott, Berry Yards Farm, Greenock, Mare, "Capable" . . .	2	0	0

SECTION 16. HORSE or MARE for Jumping.

1. David Aird, George Hotel, Kilmarnock, Gelding, "Dalhousie" . . .	20	0	0
2. Dr W. A. Orr, Westfield, Johnstone, Gelding, "Wandering Willie" . . .	10	0	0
3. Thomas Webster, Nisbetfield, Collessie, Gelding, "Sullivan" . . .	5	0	0

PONIES.

SECTION 17. STALLION, 15 Hands and under.

1. Alexander Scott, Berry Yards Farm, Greenock, "Young Messenger" . . .	6	0	0
2. John G. Mackie of Auchencairn, Castle Douglas, "Lord Wilton" . . .	3	0	0
3. Alexander Murdoch, Auchencroft, Ballantrae, "Torrent" (3338) . . .	1	0	0
C.—A. Alexander, Cockburn Hill, Balerno, "Lord Dalmahoy."			

SECTION 18. MARE or GELDING, between 13 and 14½ hands.

1. David Riddell, Blackhall, Paisley, Mare, "Water Lily" . . .	6	0	0
2. W. Stuart Palm, St Leonards, Largo, Fife, Gelding, "Jim Crow" . . .	3	0	0
3. J. Hugh Mackenzie, Fracadal, Tobermory, Mare, "Ginger" . . .	1	0	0

SECTION 19. MARE or GELDING, between 12 and 13 hands.

1. J. Harriott Bell, Rossie, Forgandenny, Gelding, "The Masher" . . .	6	0	0
2. Mrs Cheape, Wellfield, Gateside, Mare, "Garland" . . .	3	0	0

SECTION 20. MARE or GELDING, under 12 hands.

1. Charles M'Queen, Springvale Cottage, Ayr, Mare, "Ariadne" . . .	6	0	0
2. J. Harriot Bell, Rossie, Forgandenny, Gelding, "Rossie Tom" . . .	3	0	0
3. Robert Kirkwood, Camelou, Falkirk, Mare with foal at foot, "Maggie" . . .	1	0	0

SECTION 21. SHETLAND STALLION, not exceeding 10½ hands.

1. Marquis of Londonderry, Seaham Hall, Seaham Harbour, "Odin" . . .	4	0	0
2. Marquis of Londonderry, Seaham Hall, "Renolf" . . .	2	0	0
3. Alex. Cameron, Drummie, Golspie, "Duncan M'Gregor" . . .	1	0	0

SECTION 22. SHETLAND MARE or GELDING, not exceeding 10½ hands.

1. Marquis of Londonderry, Seaham Hall, Mare, "Hildigunna" . . .	4	0	0
2. Marquis of Londonderry, Seaham Hall, Mare, "Vemunda" . . .	2	0	0

Carry forward . . . £509 14 0

	Brought forward	£509 14 0
3. George Bruce, Tochineal, Cullen, Mare with foal at foot, "Beauty".		1 0 0
H. C.—George Bruce, Mare, "Nancy" (59). C.—Major H. A. Rooke, Fairholme, Mayfield Road, Aigburth, Liverpool, Mare, "Queen of the Isles."		

## SECTION 23. PONIES, 14 hands and under, for Jumping.

1. John Y. Carnegie, East Pitcorthie, Colinsburgh, Mare, "Kildare"	5 0 0
--	-------

## EXTRA HORSES.

## Very Highly Commended.

John Marr, Cairnbrogie, Old Meldrum, Clydesdale Stallion, "Cairnbrogie Stamp" (4274)	5 0 0
	£520 14 0

## CLASS III.—SHEEP.

## BLACKFACED.

## SPECIAL PRIZES GIVEN BY MR HOWATSON OF GLENBUCK.

*Five Shearling Tups, bred and fed by Exhibitor.*

1. R. & J. Cadzow, Borland, Walston, Biggar	£4 0 0
2. C. Howatson of Dornel, Glenbuck, N.B.	2 0 0
3. J. Archibald, Overshiels, Fountainhall	1 0 0

*Tup Lamb, bred and fed by Exhibitor.*

1. Charles Howatson of Dornel, Glenbuck	3 0 0
2. R. Sinclair Scott, Flatt Farm, Largs	2 0 0
3. Charles Howatson of Dornel, Glenbuck	1 0 0

*Sheep (entered in any class, Male or Female) carrying the fleece best adapted for protecting the animal in a high exposed and stormy climate.*

1. Alexander Clark, Todlaw, Lesmahagow	2 0 0
2. James Hamilton, Woolfords, Carnwath	1 0 0
3. John Millar, Lambhill, Strathaven	0 10 0

## SECTION 1. TUP above 1 Shear.

1. John Archibald, Overshiels, Fountainhall	12 0 0
2. John Archibald, Overshiels, Fountainhall	8 0 0
3. John Archibald, Overshiels, Fountainhall	4 0 0
V. H. C.—John Craig, Innergeldie, Comrie. H. C.—R. Sinclair Scott, Flatt Farm, Largs. C.—Donald T. Martin of Girgenti, Irvine.	

## SECTION 2. SHEARLING TUP.

1. John Archibald, Overshiels, Fountainhall	12 0 0
2. Charles Howatson of Dornel, Glenbuck, N.B.	8 0 0
3. R. & J. Cadzow, Borland, Walston, Biggar	4 0 0
V. H. C.—R. & J. Cadzow, Borland, Walston, Biggar. H. C.—Charles Howatson of Dornel. C.—Alexander Clark, Todlaw, Lesmahagow.	

## SECTION 3. Three EWES, above 1 Shear, with their Lambs at foot.

1. Donald T. Martin of Girgenti, Irvine	10 0 0
2. R. Buchanan, Lettre, Killearn	5 0 0
3. John Craig, Innergeldie, Comrie	2 0 0
V. H. C.—R. Sinclair Scott, Flatt Farm, Largs. H. C.—Charles Howatson of Dornel. C.—John Craig, Innergeldie, Comrie.	

---

Carry forward . . . £81 10 0

Brought forward . . . £81 10 0

SECTION 4. Three SHEARLING EWES or GIMMERS.

1. James Hamilton, Woolfords, Carnwath . . . . .	10	0	0
2. D. T. Martin of Girgenti, Irvine . . . . .	5	0	0
3. John Millar, Lambhill, Strathaven . . . . .	2	0	0
V. H. C.—Robert Buchanan, Lettre, Killearn. H. C.—R. Sinclair Scott, Flatt Farm, Largs.			

CHEVIOT.

SECTION 5. TUP, above 1 Shear.

1. Jacob Robson, Byrness, Otterburn . . . . .	12	0	0
2. John A. Johnstone, Archbank, Moffat . . . . .	8	0	0
3. Jacob Robson, Byrness, Otterburn . . . . .	4	0	0
V. H. C.—John A. Johnstone, Archbank, Moffat. H. C.—John Robson, Newton, Bellingham. C.—Jacob Robson, Byrness.			

SECTION 6. SHEARLING TUP.

1. John A. Johnstone, Archbank, Moffat . . . . .	12	0	0
2. John Robson, Newton, Bellingham . . . . .	8	0	0
3. John A. Johnstone, Archbank, Moffat . . . . .	4	0	0
V. H. C.—John Robson, Newton. H. C.—John A. Johnstone, Arch- bank. C.—John Robson, Newton.			

SECTION 7. Three EWES, above 1 Shear, with their Lambs  
at foot.

1. John Robson, Newton, Bellingham . . . . .	10	0	0
2. Jacob Robson, Byrness, Otterburn . . . . .	5	0	0
3. John Robson, Newton, Bellingham . . . . .	2	0	0
C.—Jacob Robson, Byrness, Otterburn.			

SECTION 8. Three SHEARLING EWES or GIMMERS.

1. John Robson, Newton, Bellingham . . . . .	10	0	0
2. John Robson, Newton, Bellingham . . . . .	5	0	0
3. Jacob Robson, Byrness, Otterburn . . . . .	2	0	0
C.—Jacob Robson, Byrness, Otterburn.			

BORDER LEICESTER.

SECTION 9. TUP, above 1 Shear.

1. Samuel Jack, Crichton Mains, Pathhead, Dalkeith . . . . .	12	0	0
2. Right Hon. Arthur J. Balfour of Whittinghame, M.P., Prestonkirk . . . . .	8	0	0
3. Executors of late R. Fender, Northfield, Coldingham . . . . .	4	0	0
C.—Right Hon. Arthur J. Balfour of Whittinghame, M.P.			

SECTION 10. SHEARLING TUP.

1. Thomas Clark, Oldhamstocks Mains, Cockburnspath . . . . .	12	0	0
2. Samuel Jack, Crichton Mains, Pathhead, Dalkeith . . . . .	8	0	0
3. Thomas Clark, Oldhamstocks Mains . . . . .	4	0	0
V. H. C.—Thomas Clark, Oldhamstocks Mains. H. C.—William Ford, Fenton Barns, Drem. C.—William Ford. Samuel Jack, Crichton Mains.			

SECTION 11. Three EWES, above 1 Shear.

1. Right Hon. Arthur J. Balfour of Whittinghame, M.P. . . . .	10	0	0
2. Executors of the late R. Fender, Northfield, Coldingham . . . . .	5	0	0
3. Executors of the late R. Fender, Northfield . . . . .	2	0	0
V. H. C.—James Fleming, Carmuir, Larbert.			

Carry forward . . . £245 10 0

Brought forward . . . £245 10 0

## SECTION 12. Three SHEARLING EWES or GIMMERS.

1. Thomas Clark, Oldhamstocks Mains, Cockburnspath . . . . .	10 0 0
2. William Ford, Fenton Barns, Drem . . . . .	5 0 0
3. Right Hon. Arthur J. Balfour of Whittinghame, M.P. . . . .	2 0 0
V. H. C.—Right Hon. Arthur J. Balfour, M.P. H. C.—The Earl of Morton, Dalmahoy, Kirknewton. C.—W. S. Ferguson, Pictstonhill, Perth. Executors of late R. Fender, Northfield.	

## SHROPSHIRE.

## SECTION 13. TUP, above 1 Shear.

1. David Buttar, Corston, Coupar-Angus . . . . .	10 0 0
2. David Buttar, Corston, Coupar-Angus . . . . .	5 0 0
3. Earl of Strathmore, Glamis Castle, Glamis . . . . .	3 0 0

## SECTION 14. SHEARLING TUP.

1. David Buttar, Corston, Coupar-Angus . . . . .	10 0 0
2. David Buttar, Corston, Coupar-Angus . . . . .	5 0 0
3. David Buttar, Corston, Coupar-Angus . . . . .	3 0 0
V. H. C.—David Buttar. H. C.—John Wallace, Duniface, Leven, Fife. C.—David Buttar.	

## SECTION 15. Three EWES, above 1 Shear.

1. David Buttar, Corston, Coupar-Angus . . . . .	8 0 0
2. David Buttar, Corston, Coupar-Angus . . . . .	4 0 0
3. John Wallace, Duniface, Leven . . . . .	2 0 0

## SECTION 16. Three SHEARLING EWES or GIMMERS.

1. David Buttar, Corston, Coupar-Angus . . . . .	8 0 0
2. David Buttar, Corston, Coupar-Angus . . . . .	4 0 0
3. Earl of Strathmore, Glamis Castle, Glamis . . . . .	2 0 0
V. H. C.—John Wallace, Duniface, Leven. H. C.—Earl of Mansfield, K.T., Scone Palace, Perth. C.—The Earl of Mansfield, K.T.	

## OXFORD DOWN.

## SECTION 17. TUP, above 1 Shear.

1. John C. Toppin, Musgrave Hall, Penrith . . . . .	5 0 0
2. Frederic Street, Somersham Park, St Ives . . . . .	3 0 0
V. H. C.—Right Hon. A. J. Balfour of Whittinghame, M.P.	

## SECTION 18. SHEARLING TUP.

1. Frederic Street, Somersham Park, St Ives, Hunts . . . . .	5 0 0
2. John C. Toppin, Musgrave Hall, Penrith . . . . .	3 0 0
V. H. C.—John C. Toppin, Musgrave Hall, Penrith. H. C.—Right Hon. A. J. Balfour of Whittinghame, M.P. C.—Right Hon. A. J. Balfour.	

## SECTION 19. Three EWES, above 1 Shear.

1. John C. Toppin, Musgrave Hall, Penrith . . . . .	5 0 0
2. Right Hon. A. J. Balfour of Whittinghame, M.P., . . . . .	3 0 0

## SECTION 20. Three SHEARLING EWES or GIMMERS.

1. Frederic Street, Somersham Park, St Ives, Hunts . . . . .	5 0 0
2. John C. Toppin, Musgrave Hall, Penrith . . . . .	3 0 0
V. H. C.—Right Hon. A. J. Balfour of Whittinghame, M.P.	

Carry forward . . . £358 10 0



Brought forward . . . £358 10 0

## EXTRA SECTIONS.

## SECTION 21. Three BLACKFACED WETHERS, 1 Shear.

1. John Gilmour of Montrave, Leven. Weight, 4 cwt. 22 lb.	5 0 0
2. David D. Pitcairn, Kinnaird, Newburgh. Weight, 4 cwt. 8 lb.	3 0 0
3. William Tasker, East Camno, Meigle. Weight, 3 cwt. 3 qr. 24 lb.	2 0 0
V. H. C.—William Tasker, East Camno, Meigle. Weight, 3 cwt. 2 qr. 8 lb.	

## SECTION 22. Three CHEVIOT WETHERS, 1 Shear.

1. Sir G. Graham Montgomery of Stanhope, Bart., Stobo Castle, Stobo. Weight, 4 cwt. 1 qr. 16 lb.	5 0 0
2. John Wallace, Duniface, Leven. Weight, 3 cwt. 2 qr. 13 lb.	3 0 0
3. Sir G. Graham Montgomery, Bart. Weight, 3 cwt. 2 qr. 20 lb.	2 0 0

## SECTION 23. Three CROSS-BRED WETHERS, 1 Shear.

2. John Cairns, Belhie, Auchterarder. Weight, 5 cwt. 1 qr.	.5 0 0
--	--------

## EXTRA SHEEP.

## Very Highly Commended.

John Gilmour of Montrave, Leven, Fife, 3 Cross Shearling Wethers. Weight, 7 cwt. 1 qr. and 18 lb.	Minor Gold Medal	3 6 0
---	------------------	-------

## Highly Commended.

William Tasker, East Camno, Meigle, 3 Cross Shearling Wethers. Weight, 5 cwt. 3 qr. 22 lb.	Silver Medal	0 14 0
--	--------------	--------

## Commended.

Lady William Osborne Elphinstone, Tullyallan, Kincardine-on-Forth, 2 four-horned black Hebridean Tups	Medium Silver Medal	0 9 3
Lady William Osborne Elphinstone, four-horned black Hebridean Ewe and Lamb	Medium Silver Medal	0 9 3

---

£388 8 6

---

## CLASS IV.—SWINE.

## LARGE WHITE BREED.

## SECTION 1. BOAR.

1. Arthur E. Dyson, The Hollies, Timperley, Cheshire	£5 0 0
2. The Earl of Haddington, Tynninghame, Prestonkirk	3 0 0
3. Somner Logan, Harrietfield, Kelso	1 0 0

## SECTION 2. SOW.

1. Arthur E. Dyson, The Hollies, Timperley, Cheshire	4 0 0
2. The Earl of Haddington, Tynninghame, Prestonkirk	2 0 0
3. Somner Logan, Harrietfield, Kelso	1 0 0
H. C.—Arthur E. Dyson, The Hollies, Timperley, Cheshire.	

## SECTION 3. Three PIGS, not above 8 Months old.

1. Somner Logan, Harrietfield, Kelso	4 0 0
2. Somner Logan, Harrietfield, Kelso	2 0 0
3. Arthur E. Dyson, The Hollies, Timperley, Cheshire	1 0 0

## WHITE BREED OTHER THAN LARGE.

## SECTION 4. BOAR.

1. Arthur E. Dyson, The Hollies, Timperley, Cheshire	5 0 0
2. James A. Fernie, Hilton, Alloa	3 0 0
3. The Earl of Morton, Dalmahoy, Kirknewton	1 0 0

Carry forward . . . £32 0 0

Brought forward . . . £32 0 0

## SECTION 5. SOW.

1. Arthur E. Dyson, The Hollies, Timperley, Cheshire . . .	4 0 0
2. Somner Logan, Harrietfield, Kelso . . .	2 0 0
3. The Earl of Morton, Dalmahoy, Kirknewton . . .	1 0 0

## SECTION 6. Three PIGS, not above 8 Months old.

1. Somner Logan, Harrietfield, Kelso . . .	4 0 0
2. James A. Fernie, Hilton, Alloa . . .	2 0 0
3. James A. Fernie, Hilton, Alloa . . .	1 0 0

## BLACK OR BERKSHIRE BREED.

## SECTION 7. BOAR.

1. The Earl of Haddington, Tynninghame, Prestonkirk . . .	5 0 0
2. W. Campbell, 191 Perth Road, Dundee . . .	3 0 0
3. Arthur E. Dyson, The Hollies, Timperley, Cheshire . . .	1 0 0

## SECTION 8. SOW.

1. Arthur E. Dyson, The Hollies, Timperley, Cheshire . . .	4 0 0
2. Captain Clayhills Henderson of Invergowrie, R.N., Dundee . . .	2 0 0
3. W. E. Gilmour, Woodbank, Alexandria, N.B. . . .	1 0 0
H. C.—W. Campbell, 191 Perth Road, Dundee. C.—Captain Clayhills Henderson of Invergowrie, R.N., Dundee.	

## SECTION 9. Three PIGS, not above 8 Months old.

1. W. Campbell, 191 Perth Road, Dundee . . .	4 0 0
2. W. Campbell, 191 Perth Road, Dundee . . .	2 0 0
3. W. E. Gilmour, Woodbank, Alexandria, N.B. . . .	1 0 0

## EXTRA SWINE.

## Very Highly Commended.

W. Campbell, 191 Perth Road, Dundee, Berkshire Sow with pigs at foot . . . . .	Minor Gold Medal	3 6 0
		<u>£72 6 0</u>

## CLASS V.—POULTRY.

## SECTION.

## 1. DORKING, Silver Grey. Cock—

1. James Cranston, Tinwald House, Dumfries . . .	£1 0 0
2. Bisset & Laing, Burnside, Auchtermuchty . . .	0 10 0
C.—James Clunas, 76 High Street, Elgin.	

## 2. DORKING, Silver Grey. Hen—

1. James Cranston, Tinwald House, Dumfries . . .	1 0 0
2. James Clunas, 76 High Street, Elgin . . .	0 10 0
C.—James Cranston, Tinwald House, Dumfries.	

## 3. DORKING, Silver Grey. Cockerel—

1. Robert Wood, Pannure, Carnoustie . . .	1 0 0
2. Andrew Crichton, Glamis . . .	0 10 0
C.—A. M'Crea, Clifton Hall, Ratho.	

## 4. DORKING, Silver Grey. Pullet—

1. James Cranston, Tinwald House, Dumfries . . .	1 0 0
2. Thomas Honeyman, Auchnacarry, Fort-William . . .	0 10 0
C.—Robert Wood, Pannure, Carnoustie.	

## 5. DORKING, Coloured. Cock—

1. Andrew Crichton, Glamis . . .	1 0 0
2. John Gillies, Edington Mills, Chirnside . . .	0 10 0
C.—James Cranston, Tinwald House, Dumfries.	

Carry forward . . . £7 10 0

		Brought forward	£7 10 0
6.	DORKING, Coloured. Hen—		
	1. John Gillies, Edington Mills, Chirnside	1 0 0	
	2. James Cranston, Tinwald House, Dumfries	0 10 0	
	C.—Bisset & Laing, Burnside, Auchtermuchty.		
7.	DORKING, Coloured. Cockerel—		
	1. Andrew Crichton, Glamis	1 0 0	
	2. James Cranston, Tinwald House, Dumfries	0 10 0	
	C.—William Adam, Tynet Lodge, Port-Gordon.		
8.	DORKING, Coloured. Pullet—		
	1. William Adam, Tynet Lodge, Port-Gordon	1 0 0	
	2. Andrew Crichton, Glamis	0 10 0	
	C.—James Cranston, Tinwald House, Dumfries.		
9.	COCHIN-CHINA. Cock—		
	1. Hugh Aitken, Bridge of Weir	1 0 0	
	2. W. M. Blackstock, 31 Kelvinside Gardens, Hillhead, Glasgow	0 10 0	
	C.—W. M. Blackstock, 31 Kelvinside Gardens, Hillhead, Glasgow.		
10.	COCHIN-CHINA. Hen—		
	1. W. M. Blackstock, 31 Kelvinside Gardens, Hillhead, Glasgow	1 0 0	
	2. William Christie, Ardveich, Liberton, Mid-Lothian	0 10 0	
11.	COCHIN-CHINA. Cockerel.		
	2. T. Sowerby, Cleethorpes, Lincolnshire	0 10 0	
12.	COCHIN-CHINA. Pullet—		
	2. T. Sowerby, Cleethorpes, Lincolnshire	0 10 0	
13.	BRAHMAPOOTRA. Cock—		
	1. John Gillies, Edington Mills, Chirnside	1 0 0	
	2. James Lorimer, Sundridge Cottage, Monifieth	0 10 0	
	C.—Mrs James Lorimer, 33 High Street, Dundee.		
14.	BRAHMAPOOTRA. Hen—		
	1. James Lorimer, Sundridge Cottage, Monifieth	1 0 0	
	2. John Gillies, Edington Mills, Chirnside	0 10 0	
	C.—Mrs James Lorimer, 33 High Street, Dundee.		
15.	BRAHMAPOOTRA. Cockerel—		
	2. John Gillies, Edington Mills, Chirnside	0 10 0	
16.	BRAHMAPOOTRA. Pullet—		
	2. John Gillies, Edington Mills, Chirnside	0 10 0	
17.	SCOTCH GREY. Cock—		
	1. Alex. Hamilton, Braidwood Tile Works, Carluke	1 0 0	
	2. John Carswell, Airth Mains, Airth, Larbert	0 10 0	
	C.—C. Gray, M.R.C.V.S., Cockhill Smithy, Wishaw.		
18.	SCOTCH GREY. Hen—		
	1. W. S. Mitchell, Castle Orchards, Airth, Larbert	1 0 0	
	2. Mrs Carswell, Airth Mains, Airth, Larbert	0 10 0	
	C.—W. G. M'Dougall, George Street, Stirling.		
19.	SCOTCH GREY. Cockerel—		
	1. W. S. Mitchell, Castle Orchards, Airth, Larbert	1 0 0	
	2. Alex. Robertson, Schaw Park, Alloa	0 10 0	
	C.—Alex. Hamilton, Braidwood Tile Works, Carluke.		
20.	SCOTCH GREY. Pullet—		
	1. W. S. Mitchell, Castle Orchards, Airth, Larbert	1 0 0	
	2. James S. Mitchell, Airth, Larbert	0 10 0	
	C.—Alex. Hamilton, Braidwood Tile Works, Carluke.		
21.	HAMBURG. Cock—		
	1. James Huntly, Edington Mills, Chirnside	1 0 0	
	2. William Kerr, Bandeath, Stirling	0 10 0	
	C.—J. M. Campbell, Yonderton, Bonny Kelly, New Deer, Aberdeen.		

Carry forward £27 10 0

	Brought forward	£27 10 0
22. HAMBURG. Hen—		
1. James Huntly, Edington Mills, Chirnside	1 0 0	
2. William Kerr, Bandedeath, Stirling	0 10 0	
C.—Allan Glen, 6 George Street, Paisley.		
23. HAMBURG. Cockerel—		
1. James Huntly, Edington Mills, Chirnside	1 0 0	
2. Thomson & Hunter, 28 Parkneuk, Dunfermline	0 10 0	
C.—John Morrison, Ochil Street, Alloa.		
24. HAMBURG. Pullet—		
1. J. M. Campbell, Yonderton, Bonny Kelly, New Deer, Aberdeen	1 0 0	
2. James Huntly, Edington Mills, Chirnside	0 10 0	
C.—Thomson & Hunter, 28 Parkneuk, Dunfermline.		
25. PLYMOUTH ROCK. Cock—		
1. Mrs Black, Drumhead, Cardross	1 0 0	
2. John M. Martin of Auchendennan, Balloch	0 10 0	
26. PLYMOUTH ROCK. Hen—		
1. Rev. Fitzroy Lloyd, Pittenweem, Fife	1 0 0	
2. Rev. Fitzroy Lloyd, Pittenweem, Fife	0 10 0	
C.—John M. Martin of Auchendennan, Balloch.		
27. PLYMOUTH ROCK. Cockerel—		
1. Rev. Fitzroy Lloyd, Pittenweem, Fife	1 0 0	
2. Rev. Fitzroy Lloyd, Pittenweem, Fife	0 10 0	
28. PLYMOUTH ROCK. Pullet—		
1. Rev. Fitzroy Lloyd, Pittenweem, Fife	1 0 0	
2. John M. Martin of Auchendennan, Balloch	0 10 0	
29. MINORCA. Cock—		
1. E. Graham Stirling, Strowan, Crieff	1 0 0	
2. A. G. Dippie, Crown Accident Insurance Co., Coatbridge	0 10 0	
C.—Mrs Kinnaird, Clockmill, Duns.		
30. MINORCA. Hen—		
1. W. M. Blackstock, 31 Kelvinside Gardens, Hillhead, Glasgow	1 0 0	
2. E. Graham Stirling, Strowan, Crieff	0 10 0	
C.—George Graham, Easterboard, Croy.		
31. MINORCA. Cockerel—		
1. Robert Craig, Main Street, West Kilbride	1 0 0	
2. A. G. Dippie, Crown Accident Insurance Co., Coatbridge	0 10 0	
C.—George Graham, Easterboard, Croy.		
32. MINORCA. Pullet—		
1. Robert Craig, Main Street, West Kilbride	1 0 0	
2. John Ellis, Waterhead, Eddleston	0 10 0	
C.—A. G. Dippie, Crown Accident Insurance Co., Coatbridge.		
33. LEGHORN. Cock—		
1. Mrs J. Devlin, Cemetery Road, Dunfermline	1 0 0	
2. William Holmes, Hairlaws, Bridge of Weir	0 10 0	
34. LEGHORN. Hen—		
1. Mrs J. Devlin, Cemetery Road, Dunfermline	1 0 0	
2. Neil Edington, Station-master, Howwood	0 10 0	
35. LEGHORN. Cockerel—		
1. Miss Edith M. S. Devlin, Poorhouse, Dunfermline	1 0 0	
2. Mrs B. Mackay, Windmill Lodge, Minchinhampton, Stroud	0 10 0	
36. LEGHORN. Pullet—		
1. Miss Edith M. S. Devlin, Poorhouse, Dunfermline	1 0 0	
2. Mrs W. Oswald, 64 Appin Crescent, Dunfermline	0 10 0	
C.—Neil Edington, Station-master, Howwood.		
37. LANGSHAN. Cock—		
1. Mrs Black, Drumhead, Cardross	1 0 0	
2. John S. Pagan, Coulshill, Auchterarder	0 10 0	

Carry forward £51 10 0

	Brought forward	£51 10 0
38. LANGSHAN. Hen—		
2. John S. Pagan, Coulshill, Auchterarder	0 10 0	
39. LANGSHAN. Cockerel.— <i>No Entry.</i>		
40. LANGSHAN. Pullet—		
2. Mrs Black, Drumhead, Cardross	0 10 0	
41. Any other Pure Breed. Cock—		
1. Mrs D. Mackenzie, Post Office, Meigle (Spanish)	1 0 0	
2. William G. M'Dougall, George Street, Stirling (Spanish)	0 10 0	
C.—John B. Tulloch, The Dales, Inverkeithing (Indian Game).		
42. Any other Pure Breed. Hen—		
1. Mrs D. Mackenzie, Post Office, Meigle (Spanish)	1 0 0	
2. John B. Tulloch, The Dales, Inverkeithing (Indian Game)	0 10 0	
C.—Alex. Fraser, New Mill, Alves, Forres (Spanish Black).		
43. Any other Pure Breed. Cockerel—		
1. Mrs D. Mackenzie, Post Office, Meigle (Spanish)	1 0 0	
44. Any other Pure Breed. Pullet—		
1. Mrs Kinnaird, Clockmill, Duns (Wyandotte)	1 0 0	
2. Mrs D. Mackenzie, Post Office, Meigle (Spanish)	0 10 0	
45. GAME—Black or Brown Reds. Cock—		
1. N. Taig, Waterside, Kirkintilloch	1 0 0	
2. R. G. Smith, Georgeville, Mid-Calder	0 10 0	
46. GAME—Black or Brown Reds. Hen—		
1. R. G. Smith, Georgeville, Mid-Calder	1 0 0	
2. J. & C. Sneddon, Beechbank, Ratho	0 10 0	
47. GAME—Black or Brown Reds. Cockerel—		
1. R. G. Smith, Georgeville, Mid-Calder	1 0 0	
2. J. & C. Sneddon, Beechbank, Ratho	0 10 0	
C.—William Buchanan, 34 Steeple Street, Kilbarchan.		
48. GAME—Black or Brown Reds. Pullet—		
1. J. & C. Sneddon, Beechbank, Ratho	1 0 0	
2. R. G. Smith, Georgeville, Mid-Calder	0 10 0	
C.—John Richardson, 150 Old Keppoch Hill Road, Glasgow.		
49. GAME—Any other Pure Breed. Cock—		
1. J. & C. Sneddon, Beechbank, Ratho (Duckwing)	1 0 0	
50. GAME—Any other Pure Breed. Hen—		
1. R. G. Smith, Georgeville, Mid-Calder (Pile)	1 0 0	
2. J. & C. Sneddon, Beechbank, Ratho (Duckwing)	0 10 0	
51. GAME—Any other Pure Breed. Cockerel—		
1. John Richardson, 150 Old Keppoch Hill Road, Glasgow (Pile Mackerel)	1 0 0	
2. R. G. Smith, Georgeville, Mid-Calder (Silver)	0 10 0	
C.—J. & C. Sneddon, Beechbank, Ratho (Duckwing).		
52. GAME—Any other Pure Breed. Pullet—		
1. J. & C. Sneddon, Beechbank, Ratho (Duckwing)	1 0 0	
53. BANTAM—Any Pure Breed. Cock—		
1. J. & C. Sneddon, Beechbank, Ratho (Game)	1 0 0	
2. Alex. Robertson, Schawpark, Alloa (Black Rose Comb)	0 10 0	
C.—Thomas Milne, Aberdour, Fife (Pile).		
54. BANTAM—Any Pure Breed. Hen—		
1. J. & C. Sneddon, Beechbank, Ratho (Game)	1 0 0	
2. N. Taig, Waterside, Kirkintilloch (Game)	0 10 0	
C.—Thomas Milne, Aberdour, Fife (Pile).		
55. BANTAM—Any Pure Breed. Cockerel—		
1. Hynd Brothers, 27 Parkneuk, Dunfermline	1 0 0	
2. J. & C. Sneddon, Beechbank, Ratho (Game)	0 10 0	
C.—J. K. Kilgour, Crossgates, Fife.		
	Carry forward	£73 10 0

		Brought forward .	£73 10 0
56.	BANTAM—Any Pure Breed. Pullet—		
	1. Hynd Brothers, 27 Parkneuk, Dunfermline . . . . .	1 0 0	
	2. J. K. Kilgour, Crossgates, Fife . . . . .	0 10 0	
	C.—J. & C. Sneedon, Beechbank, Ratho (Game).		
57.	DUCKS—White Aylesbury. Drake—		
	1. R. G. Smith, Georgeville, Mid-Calder . . . . .	1 0 0	
	2. R. G. Smith, Georgeville, Mid-Calder . . . . .	0 10 0	
	C.—John S. Pagan, Coulshill, Auchterarder.		
58.	DUCKS—White Aylesbury. Duck—		
	1. John Gillies, Edington Mills, Chirnside . . . . .	1 0 0	
	2. R. G. Smith, Georgeville, Mid-Calder . . . . .	0 10 0	
	C.—R. G. Smith, Georgeville, Mid-Calder.		
59.	DUCKS—White Aylesbury. Drake (Young)—		
	1. R. G. Smith, Georgeville, Mid-Calder . . . . .	1 0 0	
	2. John Gillies, Edington Mills, Chirnside . . . . .	0 10 0	
	C.—John S. Pagan, Coulshill, Auchterarder.		
60.	DUCKS—White Aylesbury. Duckling—		
	1. R. G. Smith, Georgeville, Mid-Calder . . . . .	1 0 0	
	2. John Gillies, Edington Mills, Chirnside . . . . .	0 10 0	
	C.—John S. Pagan, Coulshill, Auchterarder.		
61.	DUCKS—Rouen. Drake—		
	1. Frederic Street, Somersham Park, St Ives, Hunts . . . . .	1 0 0	
	2. R. G. Smith, Georgeville, Mid-Calder . . . . .	0 10 0	
	C.—John Gillies, Edington Mills, Chirnside.		
62.	DUCKS—Rouen. Duck—		
	1. Frederic Street, Somersham Park, St Ives . . . . .	1 0 0	
	2. Frederic Street, Somersham Park, St Ives . . . . .	0 10 0	
	C.—Mrs George Ward, Barnett House, Wolverhampton.		
63.	DUCKS—Rouen. Drake (Young)—		
	1. R. G. Smith, Georgeville, Mid-Calder . . . . .	1 0 0	
	2. Frederic Street, Somersham Park, St Ives . . . . .	0 10 0	
	C.—Thomas Scott, South Woodend, Bonnybridge.		
64.	DUCKS—Rouen. Duckling—		
	1. R. G. Smith, Georgeville, Mid-Calder . . . . .	1 0 0	
	2. The Earl of Mansfield, K.T., Scone Palace, Perth . . . . .	0 10 0	
	C.—Thomas Scott, South Woodend, Bonnybridge.		
65.	DUCKS—Any other Pure Breed. Drake—		
	1. R. G. Smith, Georgeville, Mid-Calder (Pekin) . . . . .	1 0 0	
	2. Sir Geo. Leith Buchanan, Bart., Ross Priory, Alexandria, N.B. (East Indian) . . . . .	0 10 0	
	C.—Jonathan Holliday, Kirk-Bampton, Carlisle (Pekin).		
66.	DUCKS—Any other Pure Breed. Duck—		
	1. R. G. Smith, Georgeville, Mid-Calder (Pekin) . . . . .	1 0 0	
	2. Sir Geo. Leith Buchanan, Bart., Ross Priory, Alexandria, N.B. (East Indian) . . . . .	0 10 0	
67.	DUCKS—Any other Pure Breed. Drake (Young)—		
	2. R. G. Smith, Georgeville, Mid-Calder (Pekin) . . . . .	0 10 0	
68.	DUCKS—Any other Pure Breed. Duckling—		
	2. R. G. Smith, Georgeville, Mid-Calder (Pekin) . . . . .	0 10 0	
69.	TURKEYS—Any Pure Breed. Cock—		
	1. Thomas Scott, South Woodend, Bonnybridge (Bronze) . . . . .	1 0 0	
	2. Capt. Adam Blackburn, Killearn House, Glasgow . . . . .	0 10 0	
	C.—John Balfour of Balbirnie, Markinch (Bronze Cambridge).		
70.	TURKEYS—Any Pure Breed. Hen—		
	1. Capt. Adam Blackburn, Killearn House, Glasgow . . . . .	1 0 0	
	2. Mrs George Ward, Barnett House, Wolverhampton (Bronzed American) . . . . .	0 10 0	
	C.—Thomas Scott, South Woodend, Bonnybridge (Bronze).		

---

Carry forward £94 0 0

		Brought forward	£94	0	0
71.	TURKEYS—Any Pure Breed. Cock (Poult)— 2. Abram Kerr, Castlehill, Durrisdeer, Thornhill (American Bronze).		0	10	0
72.	TURKEYS—Any Pure Breed. Hen (Poult)— 2. Abram Kerr, Castlehill, Durrisdeer, Thornhill (American Bronze).		0	10	0
73.	GEESE—Any Pure Breed. Gander— 1. R. G. Smith, Georgeville, Mid-Calder (Toulouse). 2. James Lumsden, Arden, Alexandria, N.B. (Toulouse). C.—William M'Adam, Borland, Gartmore.		1	0	0
74.	GEESE—Any Pure Breed. Goose— 1. John M. Martin of Auchendennan, Balloch (Grey Toulouse). 2. Thomas Low, Transy, Dunfermline (Toulouse). C.—R. G. Smith, Georgeville, Mid-Calder (Toulouse).		1	0	0
75.	GEESE—Any Pure Breed. Gander (Young)— 1. Thomas Scott, South Woodend, Bonnybridge. 2. John M. Martin of Auchendennan, Balloch (Grey Toulouse). C.—R. G. Smith, Georgeville, Mid-Calder (Toulouse).		1	0	0
76.	GEESE—Any Pure Breed. Gosling— 1. John M. Martin of Auchendennan, Balloch (Grey Toulouse). 2. John M. Martin of Auchendennan, Balloch (Grey Toulouse). C.—R. G. Smith, Georgeville, Mid-Calder (Toulouse).		1	0	0
			£101	0	0

## CLASS VI.—DAIRY PRODUCE.

## SECTION.

1. CURED BUTTER, not less than 28 lb.—
  1. Alexander Fleming, Threepland, Eaglesham . . . £5 0 0
  2. George Morton, Kirktonmoor, Eaglesham . . . 4 0 0
  3. Mrs Archibald Cullen, Woodend Farm, Airdrie . . . 3 0 0
  - V. H. C.—William Whyte, Nether Mill, Bishopton. H. C.—Archibald Bulloch, Milliken, Maryhill. C.—Robert Gilmour, Stonebyres, Eaglesham.
2. POWDERED BUTTER, not less than 7 lb.—
  1. Robert Gilmour, Stonebyres, Eaglesham . . . 5 0 0
  2. Mrs Archibald Cullen, Woodend Farm, Airdrie . . . 4 0 0
  3. Thomas Scott, Newlands Farm, Uddingston . . . 3 0 0
  - V. H. C.—William Whyte, Nether Mill, Bishopton. H. C.—Archibald Bulloch, Milliken, Maryhill. C.—George Morton, Kirktonmoor, Eaglesham.
3. FRESH BUTTER, Three 1-lb. Rolls—
  1. Mrs Archibald Cullen, Woodend Farm, Airdrie . . . 5 0 0
  2. Robert Gilmour, Stonebyres, Eaglesham . . . 4 0 0
  3. Archibald Bulloch, Milliken, Maryhill . . . 3 0 0
  - V. H. C.—George Morton, Kirktonmoor, Eaglesham. H. C.—William Whyte, Nether Mill, Bishopton. C.—Col. John Murray, Polmaise Castle, Stirling.
4. Two SWEET-MILK CHEESES, not less than 30 lb., made according to any method—
  1. John Drummond, Camisican, Craigie . . . 10 0 0
  2. Robert Montgomerie, Lessnessock, Ochiltree . . . 5 0 0
  3. Henry M'Fadzean, Ashfield, Maybole . . . 3 0 0
  - V. H. C.—Alexander Cross of Knockdon, Maybole. H. C.—W. H. Ralston, Culmore, Stranraer. C.—Wm. Hunter, Garthland Mains, Lochans, Stranraer.

£54 0 0

## CLASS VII.—HIGHLAND INDUSTRIES AND FISHERIES.

## SECTION.

2. WEB, not less than 25 yards TWEED, Cheviot wool, hand spun, home dyed, and hand-loom woven—			
1. Wm. Macgregor, Strathbraan, Dunkeld . . . . .	£3	0	0
3. WEB, not less than 25 yards TWEED, Blackfaced wool, hand spun, home dyed, and hand-loom woven—			
1. Mrs Alex. M'Leod, Sneavig, Harris . . . . .	3	0	0
4. WEB, 25 yards TWEED, light texture, for ladies' dresses, native wool, hand spun, home dyed, and hand-loom woven—			
1. Anne M'Kinnon, Ticcisto, Harris . . . . .	3	0	0
2. Widow C. Morrison, Scalpag, Harris . . . . .	2	0	0
H. C.—Mrs Anne M'Leod, Scalpag, Harris.			
5. WEB, HARRIS TWEED, 25 yards, home wool and manufacture—			
1. Mrs Morrison, Tarbert, Harris . . . . .	3	0	0
2. Katie Shaw, Tarbert, Harris . . . . .	2	0	0
C.—Mary M'Lennan, Tarbert, Harris.			
6. Six pair STOCKING HOSE, hand spun, home dyed, and knitted by Exhibitor,—two pair plain ribbed, two pair diced tartan, two pair fancy—			
1. Anne Mackenzie, Port Henderson, Gairloch . . . . .	3	0	0
2. Ann M'Aulay, Opinan, Gairloch . . . . .	2	0	0
10. Fine White SHETLAND SHAWL—			
1. Ann Nisbet, Ann Cottage, Burgess Street, Lerwick . . . . .	2	0	0
2. Ann Nisbet, Gritquoy, Uyasound, Unst . . . . .	1	0	0
11. Thick Coloured SHETLAND SHAWL—			
1. Christina Petrie, Gossaburgh, East Yell . . . . .	2	0	0
2. Christina Thomson, Gossaburgh, East Yell . . . . .	1	0	0
H. C.—Cathrine Williamson, care of Wm. Traill, 23 Duke Street, Edinburgh.			
13. Varieties of YARN, not less than eight, hand spun, home dyed, and of native wool; 4 cuts of each colour—			
1. Eliza Umphrey, Lerilack, Island of Foula . . . . .	1	0	0
2. Mary Paterson, Sloag, Island of Foula . . . . .	0	10	0
14. Six Pair STOCKINGS, shop wool, but knitted by Exhibitor—			
1. Eliza Finlay, 26 High Street, Montrose . . . . .	1	0	0
	£29	10	0

## ABSTRACT OF PREMIUMS.

Cattle . . . . .	£848	15	8
Horses . . . . .	520	14	0
Sheep . . . . .	388	8	6
Swine . . . . .	72	6	0
Poultry . . . . .	101	0	0
Dairy Produce . . . . .	54	0	0
Highland Industries . . . . .	29	10	0
	£2014	14	2

## JUDGES.

SHORTHORN.—R. Stratton, The Duffryn, Newport, Mon.; Robert Bruce, Elm Grove, Darlington; Donald Fisher, Pitlochrie.

AYRSHIRE.—John Caldwell, Bogside, Dundonald; Charles Duncan, Little Kilmory, Rothesay; James Howie, Burnhouses, Kilmarnock.

ABERDEEN-ANGUS.—C. Stephenson, Sandyford Villa, Newcastle-on-Tyne; Thomas Ferguson, Kinochtry, Coupar-Angus; James Walker, Westside of Brux, Kildrummy.



GALLOWAY.—James Cranston, Tinwald House, Dumfries; John M<sup>c</sup>Turk, Cuil Park, Bridge of Dee, Castle-Douglas.

HIGHLAND.—Robert Macdiarmid, Castles, Lochawe; James J. Robertson, Kinloch, Morvern, Oban; Robert Allan, Glenmore, Lochgilphead.

STALLIONS AND ENTIRE COLTS.—W. H. Ralston, Culmore, Strauraer; John Morrison, jun., Hattonslap, Tarves, Old Meldrum; T. Kerr, Kirkchrist, Kirkcudbright.

MARES AND FILLIES.—Robert Andrew, Smeaton, Dalkeith; James Park, Dechmont, Cambuslang; Alexander Burr, Tulloford, Old Meldrum.

HUNTERS, ROADSTERS, AND PONIES.—Colonel F. Barlow, Hasketon, Woodbridge, Suffolk; Adam P. Cross, Craigiehall, Cramond Bridge, Mid-Lothian.

BLACKFACED.—Duncan M<sup>c</sup>Diarmid, Camusericht, Rannoch; Alexander Cowan, Spittalhill, Fintry; James Murray, Ploughland, Strathaven.

CHEVIOT.—William Mitchell, Ribigill, Tongue, Sutherland; Thomas Elliot, Attonburn, Kelso; John Scott, Deloraine, Selkirk.

BORDER LEICESTER.—Andrew Smith, Longniddry; D. Cameron, Fettes, Muir of Ord; John Mark, Sunnyside, Prestonkirk.

SHROPSHIRE AND OXFORD DOWN.—Alfred Tanner, Shrawarline, Montford Bridge, R.S.O.

FAT SHEEP.—John C. Speedie, Auction Mart, Stirling.

SWINE.—James Barr, Royal Asylum, Gartnavel, Glasgow.

POULTRY.—George Hall, 10 Belford Terrace, Sunderland; Charles Ralston, Garscube Estate Office, Maryhill, Glasgow.

DAIRY PRODUCE.—James Weir, 71 Brunswick Street, Glasgow.

HIGHLAND INDUSTRIES AND FISHERIES.—Lady Strathallan; Mrs Drummoud Forbes, Millearnie, Auchterarder; Miss Margaret H. M. MacGregor of MacGregor.

#### ATTENDING MEMBERS.

SHORTHORN.—John Cran, Kirkton; Sir Allan H. Seton-Stewart of Touch, Bart; Edwin Bolton, West Pleau.

AYRSHIRE.—R. G. Wardlaw Ramsay of Whitehill; John Duncan of Auchenee; James MacLachlan, Doune Lodge.

ABERDEEN-ANGUS.—Duncan Forbes of Culloden; David Ballingall, Blair-Drummond; William Drysdale, King of Muirs.

GALLOWAY.—Donald Fisher, Jellyholm; J. M. Morris-Stirling, Gogar House; James A. Fernie, Hilton, Alloa.

HIGHLAND.—Sir Robert Menzies of Menzies, Bart.; W. S. Young, Keir Mains; Peter M<sup>c</sup>Caul, Knockhill.

STALLIONS AND ENTIRE COLTS.—William Ford, Fentonburns; John Marr, Cairnbrogie; Charles Carrick, Baal.

MARES AND FILLIES.—Alexander Murdoch, Garterraig; A. E. Graham Moir of Leckie; Robert Paterson, Hill of Drip.

HUNTERS, ROADSTERS, AND PONIES.—Alexander Macduff of Bonhard; W. Burt Wright of Auchinvoile; A. H. Anderson, Kippenross Estate Office.

BLACKFACED.—A. M. Gordon of Newton; James Lumsden of Arden; John Edmund, Gallamuir.

CHEVIOT.—R. Shirra Gibb, Boon; James Murray, Catter House; James Fleming, Carmuir.

BORDER LEICESTER.—John M. Aitken, Norwood; George Younger, Brewer; Andrew Reid, Haining Valley.

SHROPSHIRE AND OXFORD DOWN.—John Craig, Innergeldie; Colonel Stirling of Gar-gunock; Bailie Menzies, Stirling.

FAT SHEEP.—Colonel Murray of Polmaise; Bailie Brown, Stirling.

SWINE.—W. H. Lumsden of Balmedie; William Stirling of Tarduff; Dean of Guild Miller, Stirling.

POULTRY.—Capt. Clayhills Henderson of Invergowrie, R.N. ; Angus Fletcher, Auchtertyre, Tyndrum.

DAIRY PRODUCE.—Provost Yellowlees, Stirling ; Ex-Dean of Guild Mercer, Stirling ; James M'Laren, Cornton, Bridge of Allan.

## III.—DISTRICT COMPETITIONS.

## CATTLE, HORSES, AND SHEEP.

NAME OF DIST.	PREMIUM AWARDED TO	FOR	AMOUNT.
<i>Gargunnoch</i>	James Sands, Greenfoot	Ayrshire Cow . . .	£3 0 0
	James M'Farlane, Oxhill	Ayrshire Bull . . .	3 0 0
	R. C. M'Farlane, West Carse	Clydesdale Mare . . .	3 0 0
	James Risk, West Culmore	Two-year-old Filly . . .	3 0 0
<i>Sutherland</i>	J. Mackintosh, Proucy	Mare with Foal at foot . . .	1 0 0
	Duke of Sutherland, K.G.	Mare without Foal . . .	1 0 0
	Hugh Ross, Inverbrora	Two-year-old Filly . . .	1 0 0
	J. B. Dudgeon, Crakaig	Filly Foal . . .	1 0 0
	Duke of Sutherland, K.G.	Shorthorn Bull (any age) . . .	1 0 0
	Duke of Sutherland, K.G.	Shorthorn Bull (yearling) . . .	1 0 0
	Duke of Sutherland, K.G.	Polled Bull . . .	1 0 0
	A. Cameron, Kirkton	Polled Cow . . .	1 0 0
	J. B. Dudgeon, Crakaig	Cheviot Tup . . .	1 0 0
	J. B. Dudgeon, Crakaig	do. Shearling Tup . . .	1 0 0
	J. B. Dudgeon, Crakaig	do. Ewes . . .	1 0 0
	J. B. Dudgeon, Crakaig	do. Gimmers . . .	1 0 0
<i>Stranraer and Rhins of Gallo- way</i>	Wm. Murray, Borrowmoss	Ayrshire Cow . . .	3 0 0
	Alex. Dalrymple, Midton	do. Bull . . .	3 0 0
	Robt. Frederick, Drumflower	Clydesdale Mare . . .	3 0 0
	Matthew Marshall, Strauraer	do. Stallion . . .	3 0 0
<i>Spey, Aven, and Fidd- dochside</i>	Jas. M'William, Stoneytown	Shorthorn Bull . . .	2 0 0
	Repres. of James Bruce, Burnside	do. . . .	1 0 0
	W. M. Skinner, Drumin	Aberdeen-Angus Bull . . .	2 0 0
	J. R. Findlay of Aberlour	do. . . .	1 0 0
	A. Hutcheson, Belnagarron	Draught Mare . . .	2 0 0
	Repres. of J. Smith, Crag-gannore	Draught Filly . . .	1 0 0
	Mrs Russell, Midtown	Blackfaced Sheep . . .	1 0 0
	James Shiach, Wardhead	do. . . .	0 10 0
	James Sutor, Collie	Leicester Sheep . . .	1 0 0
	James Sutor, Collie	do. . . .	0 10 0
<i>Jel-Forest</i>	W. L. Johnstone, Oxnam Nook	Draught Mare . . .	2 0 0
	John Pringle, East Nisbet	do. . . .	1 0 0
	John Hogarth, Heiton Mill	Yearling Ox . . .	2 0 0
	John Simson, Oxnam Row	do. . . .	1 0 0
	J. T. S. Elliot of Wolfelee	Half-bred Shearling Tup . . .	2 0 0
	John Simson, Oxnam Row	do. . . .	1 0 0
	John Elliot, Hindhope	Cheviot Shearling Tups . . .	2 0 0
	George Douglas, Upper Hindhope	do. do. . . .	1 0 0
<i>Lammermoor Pastoral</i>	W. & W. Elliot, Harehead	Half-Bred Ewes . . .	1 0 0
	William Elliot, Eilemford	do. Gimmers . . .	1 0 0
	James Mein, Lamberton	do. Ewe Lambs . . .	1 0 0
Carry forward			£63 0 0

NAME OF DIST.	PREMIUM AWARDED TO	FOR	AMOUNT.
		Brought forward	£63 0 0
	J. F. Bayley, Halls	Cheviot Ewes . . .	1 0 0
	J. F. Bayley, Halls	do. Gimmers . . .	1 0 0
	J. & A. M. Caverhill, Crichness	do. Ewe Lambs . . .	1 0 0
	Lady John Scott, Flass	Blackfaced Ewes . . .	1 0 0
	Lady John Scott, Flass	do. Gimmers . . .	1 0 0
	Lady John Scott, Flass	do. Ewe Lambs . . .	1 0 0
	James Logan, Burnhouses	Three-year-old Filly . . .	1 0 0
	Wm. Elliot, Raecloughhead	Two-year-old Filly . . .	1 0 0
	James Logan, Burnhouses	One-year-old Filly . . .	1 0 0
<i>Garioch</i>	A. M. Gordon of Newton	Shorthorn Bull	Minor Silver Medal
	A. M. Gordon of Newton	Shorthorn Cow	Minor Silver Medal
	James Stephen, Conglass	Aberdeen-Angus Bull	Minor Silver Medal
<i>Dalbeattie</i>	Wm. Gilmour, Balmangan	Ayrshire Bull	Minor Silver Medal
	Mark J. Stewart of Southwick, M.P.	Ayrshire Cow	Minor Silver Medal
	John Lindsay, Dunjop	Ayrshire Heifer	Minor Silver Medal
<i>Deeside Union</i>	John Davidson, Harestone	Shorthorn Bull	Minor Silver Medal
	James Calder, Cairnton	Aberdeen-Angus Bull	Minor Silver Medal
	David Nicol, Upper Anguston	Shorthorn Heifer	Minor Silver Medal
<i>Turriff</i>	George Watson, Old Craig	Shorthorn Bull	Minor Silver Medal
	G. A. Duff of Hatton	Aberdeen-Angus Bull	Minor Silver Medal
	Geo. Bean, Balquhain Mains	Clydesdale Mare	Minor Silver Medal
<i>Biggar</i>	Robert Noble, Skirling Farm	Ayrshire Cow	Minor Silver Medal
	John Fraser, Little Gala	Ayrshire Bull	Minor Silver Medal
<i>Breadalbane</i>	John Hamilton, Conenish	Blackfaced Aged Tup	Minor Silver Medal
	John Fisher, Auchrioch	Blackfaced Shearling Tup	Minor Silver Medal
	Trustees of the late John Willison, Glenlochay	Blackfaced Ewes	Minor Silver Medal
<i>Eastern District of Shiringshire</i>	Robt. Carswell, Airth Mains	Shorthorn Cow	Minor Silver Medal
	David Mitchell of Millfield	Brood Mare	Minor Silver Medal
<i>Selkirk and Galashiels</i>	Alex. Scott, Greenock	Stallion . . . .	15 0 0
<i>Nairnshire</i>	Earl Cawdor, Cawdor Castle	Stallion . . . .	15 0 0
<i>Elgin, &amp;c.</i>	W. H. Lunsden of Balmedie	Stallion . . . .	15 0 0
<i>Lanark, &amp;c.</i>	William Montgomery, Banks	Stallion . . . .	15 0 0
<i>Inverness</i>	W. C. Ross of Cromarty	Two-year-old Filly . . .	2 0 0
	C. Lyon Mackenzie of Braelangwell	do. . . .	1 0 0
	The Mackintosh of Mackintosh	do. . . .	0 10 0
Carry forward			£135 10 0

NAME OF DIST.	PREMIUM AWARDED TO	FOR	AMOUNT.
		Brought forward	£135 10 0
	Earl Cawdor, Cawdor Castle	One-year-old Filly	2 0 0
	Earl Cawdor, Cawdor Castle	do.	1 0 0
	Wm. Robertson, Linkwood	do.	0 10 0
<i>Kinross-shire</i>	William Tod, Cash	Two-year-old Filly	2 0 0
	William Young, Lathro	do.	1 0 0
	John Paton, Kirkness	do.	0 10 0
	W. Flockhart of Annicroich	One-year-old Filly	2 0 0
	Thos. Lumsdane, Muckarey } Mill }	do.	1 0 0
	William Young, Lathro	do.	0 10 0
			£146 0 0
	19 Minor Silver Medals		5 1 4
			£151 1 4

## SPECIAL GRANTS.

<i>Ayrshire Agricultural Association</i>	{ Vote to Dairy Produce Show at } Kilmarnock	£20 0 0
<i>Orkney Agricultural Society</i>	Vote in aid of Premiums	3 0 0
<i>Rousay Agricultural Society</i>	do.	3 0 0
<i>South Uist and Barra</i>	do. do.	3 0 0
<i>North Uist</i>	do. do.	3 0 0
		£32 0 0

## MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

Minor Silver Medals were awarded to the following:—

## ABERDEENSHIRE.

NAME OF DIST.	SILVER MEDAL AWARDED TO	FOR
<i>Auchindoir, &amp;c.</i>	John Reid, Nether Kildrummy	Aberdeen-Angus Cow
	James Gordon, Ley	Draught Mare
<i>Cluny, Monymusk, &amp;c.</i>	William Connors, Nether Coullie	Shorthorn Bull
	William L. Chivas, Nether Inver	Brood Mare
<i>Cromar, Upper Dee, &amp;c.</i>	Marquis of Huntly, Aboyne Castle	Aberdeen-Angus Bull
	Marquis of Huntly, Aboyne Castle	Aberdeen-Angus Heifer
<i>Fyvie</i>	James Taylor, Old Moss	Shorthorn Bull
	John Cassie, Westertown	{ Mare and two of her progeny
<i>Mar</i>	William Robertson, Aquhoish	Aberdeen-Angus Bull
	A. C. Pirrie, Craibstone	Shorthorn Bull
<i>Ythanside</i>	R. Copland, Milton Ardllethen	Two-year-old Filly
	George Walker, Tillygreig	Two-year-old Ox

## ARGYLSHIRE.

<i>Islay, Jura, and Colonsay</i>	P. & A. M'Lachlan, Braigo	Highland Heifer
	William Taylor, Mulindry	Ayrshire Cow
<i>Kilfinan</i>	George Lyon, Kildavaig	Clydesdale Mare
	George Lyon, Kildavaig	Ayrshire Cow
<i>Kintyre</i>	William Maxwell, Baraskomil	Blackfaced Tup
	Archibald Mackay, Lephonstrath	Sweet-milk Cheese
<i>Lorn</i>	Dugald Clerk, Duntanachan	Highland Bull
	Alex. Longwill, Ardconnel	Ayrshire Bull
<i>Mull and Morven</i>	Lord Howard of Glossop	Highland Bull
	John MacPhail, Scallastle	Highland Heifer
<i>South of Mull</i>	Lachlan M'Innes, Aros Mains	Draught Filly
	H. & J. Lyon, Kilpatrick	Draught Foal

NAME OF DIST.	SILVER MEDAL AWARDED TO	FOR
<b>AYRSHIRE.</b>		
<i>Carrick</i>	Henry M'Fadzean, Ashfield R. Paton, Trees	Ayrshire Bull Ayrshire Cow
<i>Coylton and Stair</i>	Arch. M'Cartney, Wrighthill Andrew Logan, Overton	Ayrshire Cow Clydesdale Mare
<i>Craigie</i>	James Kilpatrick, jun., Craigie Mains James Picken, Laigh Langside	Ayrshire Cow Clydesdale Mare
<i>Galston, Loudoun,     &amp;c.</i>	Major Alex. Steel, Burnhead George Alston, Loudounhill	Ayrshire Cow Clydesdale Mare
<i>Kilmarnock</i>	D. T. Martin of Girenti Robert Buchanan, Letter	Blackfaced Tup Blackfaced Ewe
<i>Muirkirk</i>	Gavin Moffat, Kaims Robert Jack, Dykehead	Ayrshire Cow Clydesdale Mare
<b>BERWICKSHIRE.</b>		
<i>Lauderdale</i>	John R. Lumsden, Fountainhall John Bertram, Addinston	Horses Sheep
<b>BUTE.</b>		
<i>Bute</i>	Hugh M'Fie, Ballycaul Daniel M'Intyre, Dunallan	Ayrshire Bull Clydesdale Mare
<b>FIFESHIRE.</b>		
<i>Auchtermuchty</i>	James Thom, Leden Urquhart Andrew Brown, Rossie	Border Leicester Tup Leicester Ewes
<i>Ballingry and     Auchterderran</i>	William Meiklem, Begg James Auchterlonie, Dothian	Collection of Grain Collection of Roots
<i>Cupar and     North of Fife</i>	Alex. Auchterlonie, Hayston Francis W. Christie, Dairsie Mains	Brood Mare Shorthorn Cow
<i>Western District     of Fife</i>	J. & W. Meiklem, Begg Edward Balfour, yr. of Balbirnie	Shorthorn Bull Clydesdale Filly
<b>HADDINGTONSHIRE.</b>		
<i>United East     Lothian</i>	Right Hon. A. J. Balfour of Whitting- hame, M.P. Right Hon. A. J. Balfour of Whitting- hame, M.P.	} Border Leicester Tup } Border Leicester Ewes
<b>INVERNESS-SHIRE.</b>		
<i>Northern Counties     Fat Show</i>	J. D. Fletcher of Rosehaugh James Brander, Pittendreich	Fat Polled Heifer Cross Wether Hogs
<b>LANARKSHIRE.</b>		
<i>Abington</i>	John Morton, Nether Abington John Paton, Glengeth	Blackfaced Tup Lamb Cheviot Tup Lamb
<i>Carmunnock</i>	James Fleming, Muirside William Ballantine, Busbyside	Ayrshire Cow Ayrshire Bull
<b>LINLITHGOWSHIRE.</b>		
<i>West Lothian</i>	John Meikle, Grougfoot James Allison, Claylands	Ayrshire Cow Clydesdale Mare
<b>PERTHSHIRE.</b>		
<i>Strathearn</i>	Colonel Stirling of Kippendavie John Craig, Innergeldie	Clydesdale Mare Leicester Tup
<i>Strathearn Central</i>	W. S. Ferguson, Pictstonhill John Baillie, Newbigging	Leicester Shearling Tup Clydesdale Filly
<i>Weem</i>	James Leslie, Balhomais Sir Donald Currie of Garth, M.P.	Draught Gelding Salt Butter
<b>RENFREWSHIRE.</b>		
<i>Kilmalcolm and     Port-Glasgow</i>	William Scott, Craigends Donald Black, Auchenoyle	Ayrshire Cow Clydesdale Mare
<i>Lower Ward of     Renfrew</i>	R. Sinclair Scott, Flatt Farm Robert Meiklam, Shillingworth	Blackfaced Ewe Hogs Leicester Tup
<i>Renfrewshire</i>	Alexander Young, Castlehill John Pollock, Springside	Ayrshire Cow Leicester Ewe

NAME OF DIST.	SILVER MEDAL AWARDED TO	FOR
	STIRLINGSHIRE.	
<i>Falkirk</i>	Alexander Paterson, High Station James Crawford, Dunmore Village	Observatory Hive Display of Honey
	72 Minor Silver Medals, £19, 4s.	

### PLOUGHING COMPETITIONS.

In 1890-91 the Society's Silver Medal was awarded at 182 Ploughing Competitions.  
182 Minor Silver Medals, £48, 10s. 8d.

### IV.—COTTAGES AND GARDENS.

Money Premiums . . . . .	£3 0 0
35 Minor Silver Medals . . . . .	9 6 8
Total . . . . .	<u>£12 6 8</u>

### V.—VETERINARY DEPARTMENT.

#### CLASS EXAMINATIONS—1891.

Silver Medals were awarded to the following:—

#### ROYAL (DICK) VETERINARY COLLEGE.

George Green	Junior Anatomy	Alex. Pottie	Cattle Pathology
G. W. Sturgess	Senior Anatomy	J. H. White	Chemistry
C. Hay	Senior Anatomy	W. Sturdy	Materia Medica
G. W. Sturgess	Physiology	W. Sturdy	Pathology
Alex. Pottie	Vet. Med. & Surgery	George Green	Botany

#### NEW VETERINARY COLLEGE, EDINBURGH.

Chas. Haywood	Morbid Anatomy	H. G. Bowes	Chemistry
O. C. Bradley	Senior Anatomy	M. Dee	Botany
O. C. Bradley	Physiology	D. W. Simpson	Veterinary Hygiene
H. G. Bowes	Junior Anatomy	D. W. Simpson	Veterinary Hygiene

#### GLASGOW VETERINARY COLLEGE.

Stuart C. Pottie	Horse Pathology	Robert Moore	Junior Anatomy
John A. Gilruth	Cattle Pathology	James Paton	Chemistry
James Furniss	Anatomy	Joseph Magee	Botany
William Dawson	Histology, &c.	John Neill	Materia Medica

26 Large Silver Medals, £18, 4s.

### VI.—AGRICULTURAL CLASS, EDINBURGH UNIVERSITY.

R. B. Greig, Balcurnie, Windygates, Fife . . . . .	£3 6 8
T. A. Coward, Eden Town, Carlisle . . . . .	3 6 8
James Mackinnell, Kilmartin, Lochgilphead . . . . .	3 6 8
Total . . . . .	<u>£10 0 0</u>

## ABSTRACT OF PREMIUMS.

1. ESSAYS AND REPORTS,	. . . . .	£40 0 0	
2. STIRLING SHOW, 1891,	. . . . .	2014 14 2	
3. DISTRICT SHOWS:—			
Stock	. . . . .	£151 1 4	
Special Grants	. . . . .	32 0 0	
Local Societies—72 Medals	. . . . .	19 4 0	
Ploughing Associations—182 Medals	. . . . .	48 10 8	
			250 16 0
4. COTTAGES AND GARDENS—Money Premiums, £3; 35 Minor Silver			
Medals, £9, 6s. 8d.	. . . . .	12 6 8	
5. VETERINARY DEPARTMENT—Medals to Students	. . . . .	18 4 0	
6. AGRICULTURAL CLASS, EDINBURGH UNIVERSITY	. . . . .	10 0 0	
			<u>£2346 0 10</u>

# STATE OF THE FUNDS

## OF

# THE HIGHLAND AND AGRICULTURAL SOCIETY

## OF SCOTLAND

At 30th NOVEMBER 1891.

I. BONDS—			
Heritable—£11,000 at 4½ per cent, £1,300 at 4 per cent,			
£4,000 at 3½ per cent, £500 at 3½ per cent,		£16,800	0 0
Debenture Bonds by Clyde Navigation Trustees at 4 per cent,		2,000	0 0
		<hr/>	
		£18,800	0 0
II. DEBENTURE STOCK—			
£3,000 North British Railway Company 4½ per cent, at £126, 17s. 6d.,	£3,806	5	0
£2,727 Caledonian Railway Company 4 per cent, at £127, 5s.,	3,470	2	0
£1,000 London and North-Western Railway Company 4 per cent, at £134,	1,340	0	0
	<hr/>		8,616 7 0
III. BANK STOCK—			
£6,407, 7s. 8d. Royal Bank of Scotland, at £220, 10s.,	£14,128	5	7
£2,218, 16s. 5d. Bank of England, at £338,	7,499	12	3
£2,000, 0s. 0d. British Linen Company Bank, at £343,	6,860	0	0
£1,250, 0s. 0d. National Bank of Scotland, at £320,	4,000	0	0
£1,080, 0s. 0d. Commercial Bank of Scotland (equivalent to 54 shares of £100 each, £20 paid), at £63, 10s.,	3,429	0	0
£1,091, 13s. 4d. Bank of Scotland, at £310,	3,384	3	4
	<hr/>		39,301 1 2
£14,047, 17s. 5d.			
<i>Note.</i> —The original cost of these Bank Stocks was £22,360, 19s. 6d., showing a profit, at present prices, of £16,940, 1s. 8d.			
IV. TEN SHARES (£500) OF THE BRITISH FISHERIES SOCIETY, valued at			
		200	0 0
V. ARREARS OF MEMBERS' SUBSCRIPTIONS, considered recoverable,			
		54	10 0
		<hr/>	
		£66,971	18 2
<i>Deduct.</i> —BALANCE DUE TO ROYAL BANK ON ACCOUNT CURRENT, at 30th November 1891,			
		527	18 6
		<hr/>	
AMOUNT OF GENERAL FUNDS,		£66,443	19 8
VI. BUILDING FUND—			
1. Estimated value of Building, No. 3 George IV. Bridge,	£3,100	0	0
2. Sum lent on Heritable Bond, at 3½ per cent,	350	0	0
3. Deposit with Royal Bank of Scotland,	117	18	4
	<hr/>		£3,567 18 4
AMOUNT OF BUILDING FUND, .		£3,567	18 4
VII. TWEEDDALE MEDAL FUND—			
Heritable Bond, at 3½ per cent,		£500	0 0
		<hr/>	
VIII. FURNITURE—			
Estimated Value of Furniture, Paintings, Books, &c.,		£1,000	0 0
		<hr/>	

W. S. WALKER, *Treasurer.*

JAMES H. GIBSON-CRAIG, *Vice-Chairman of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 5th January 1892.



# **ABSTRACT of the ACCOUNTS of the HIGHLAND and CHARGE.**

1. DEPOSIT RECEIPT with Royal Bank of Scotland in name of Building Fund,		£103 14 11
2. ARREARS of Annual Subscriptions at 30th Nov. 1890,	£47 12 6	
Whereof due by Members who have now compounded for life, and are thereby extinguished,	£7 13 6	
Sums ordered to be struck off,	14 4 0	
	<u>21 17 6</u>	25 15 0
3. INTERESTS AND DIVIDENDS—		
(1) Interests on Heritable Bonds, less Income-tax,	£669 16 10	
(2) Interests on Debenture Bonds, Do.	78 0 0	
(3) Interests on Debenture Stock, Do.	269 13 2	
	<u>£1,017 10 0</u>	
Deduct. — Interest on Overdraft on Account Current with Royal Bank of Scotland for year to 30th November 1891,	1 4 3	
	<u>£1,016 5 9</u>	
(4) Dividends on Bank Stocks—		
£6,407, 7s. 8d. Royal Bank of Scotland,	£576 13 2	
2,218, 16s. 5d. Bank of England,	244 1 4	
2,000, 0s. 0d. British Linen Co. Bank,	280 0 0	
1,250, 0s. 0d. National Bank of Scotland,	187 10 0	
1,080, 0s. 0d. Commercial Bank of Scotland,	151 4 0	
1,091, 13s. 4d. Bank of Scotland,	141 18 4	
	<u>£14,047, 17s. 5d.</u>	1,581 6 10
(5) Dividend on 10 shares, British Fisheries Society,	10 0 0	
	<u>2,607 12 7</u>	
4. INCOME from Building Fund—		
Interest on Heritable Bond for £350, less tax,	£11 18 10	
Interest on Deposits with Royal Bank,	2 4 7	
	<u>14 3 5</u>	
5. SUBSCRIPTIONS—		
Annual Subscriptions,	£742 17 0	
Life Members,	548 18 0	
	<u>1,291 15 0</u>	
6. RECEIPTS in connection with former Shows,	8 15 0	
7. TRANSACTIONS—Sales from Messrs Blackwood & Sons for year 1890,	8 15 2	
8. BALANCE of Receipts from Stirling Show,	1,448 16 6	
9. SUM received from Government in aid of Agricultural Experiments,	150 0 0	
10. INVESTIGATION as to Abortion in Cows, Subscriptions, &c., received,	72 10 6	
11. BALANCE due to Royal Bank of Scotland on Account Current, at 30th November 1891,	527 18 6	

SUM OF CHARGE, . . . £6,259 16 7

# AGRICULTURAL SOCIETY of SCOTLAND for the Year 1890-91.

## DISCHARGE.

1. BALANCE due to Royal Bank of Scotland on Account Current at 30th November 1890,			£348	6	8
2. ESTABLISHMENT EXPENSES—					
Salary to Secretary,	£850	0	0		
Salary to Clerk, £300; Second Clerk, £150,	450	0	0		
Wages to Messenger,	72	0	0		
Fen-duty, £28; Water Rates, £2, 3s. 4d.; Taxes, £34, 5s. 8d.,	64	9	0		
Coals and Firewood, £11, 18s.; Gas, £10, 2s. 6d.; Insurance, £8, 14s. 8d.,	30	15	2		
Repairs and Furnishings,	19	15	8		
				1,486	19 10
3. FEE to Auditor of Accounts for year 1889-90,				50	0 0
4. FEE to Practical Engineer for year,				20	0 0
5. AGRICULTURAL EDUCATION—					
Grant to Professor of Agriculture, £150; Prizes to Class, £10; Bursaries, £60; Fees to Examiners, Expenses, and Luncheons, £47,				267	0 0
6. CHEMICAL DEPARTMENT—					
Salary to Chemist, £200; Allowance for Expenses, £200,	£400	0	0		
Experimental Station at Pumpherston—Superintendent's Allowance, £15, 15s.; Manures, £10, 11s. 6d.,	26	6	0		
Manures for District Experiments, and Expenses,	42	19	2		
Cases for Dairy Experiments of Ayrshire Agricultural Science Association,	3	10	0		
Vermorils No. 1 Eclair Spraying Pump for Government Experiments on Potatoes,	1	15	0		
Medal to Mr Alex. Lawrence for Experiments on Feeding Ox,	0	14	0		
Grants to Analytical Associations,	87	5	0		
Printing,	10	15	0		
				578	4 11
7. VETERINARY DEPARTMENT—Fee to Professor Williams, £26, 5s.; Medals to Students, £18, 4s.,				44	9 0
8. BOTANICAL DEPARTMENT—Fee to Botanist for year,				25	0 0
9. SPECIAL GRANTS—Vote to Dairy Department, £100; Vote to Glasgow and West of Scotland Technical College, £50,				150	0 0
10. SOCIETY'S TRANSACTIONS—Printing, £200, 16s.; Binding and Postage, £135, 0s. 6d.; Delivering, £2, 2s.,				346	18 6
11. ESSAYS AND REPORTS,				100	0 0
12. ORDINARY Printing and Lithographing, £56, 15s. 6d.; Advertising, £21, 2s. 2d.; Stationery, Books, &c., £38, 17s. 4d.; Postage and Receipt Stamps, £60; Bank and Post-Office Charges and Telegrams, £8, 2s. 11d.,				179	17 11
13. SUBSCRIPTIONS to Public Societies—Scottish Meteorological Society, £20; Society for Prevention of Cruelty to Animals, £5,				25	0 0
14. MISCELLANEOUS EXPENSES—Secretary's Expenses attending Meetings for Nomination of Directors, £23, 5s. 6d.; Preparing and Addressing Circulars to Members in the eight Show Districts regarding Nomination of Directors, £5; Reporting Board Meetings, £21; Luncheons to Directors, £13, 16s.; Secretary's Expenses attending Trial of Acidity-Testers at Kilnarnock, £4, 7s. 6d.; Compiling Tables of Prices of Grain in Edinburgh Markets in 1890, £2; Printing Circulars to County Councillors, &c., £6, 19s. 6d.; Rev. John Gillespie's Expenses to London in connection with Uniformity of Examination in Dairy Work, £7, 7s.; Messrs Todd, Murray, & Jamieson's Business Account for 1890, £9, 15s. 9d.; Storing Turnstiles, £5; Repairing Turnstiles, £9, 11s.; Handbills, £1, 10s.; New Minor Medal Die, "Arms," £6, 10s.,				116	2 3
15. PREMIUMS—					
Dundee Show,	£174	0	0		
Stirling Show,	1,807	4	2		
	£1,981	4	2		
District Competitions,	389	4	8		
Cottages and Gardens,	11	3	4		
				2,381	12 2
16. PAYMENT in connection with former Show—Dundee,				0	2 0
17. ARREARS of Subscriptions struck off as irrecoverable,				22	15 0
18. ARREARS considered recoverable,				54	10 0
19. SUM on Deposit Receipt of Royal Bank of Scotland, of date 11th November 1891, in name of "Building Fund,"				117	18 4
SUM OF DISCHARGE,				£3,259	16 7

W. S. WALKER, *Treasurer.*

JAMES H. GIBSON-CRAIG, *Vice-Chairman of Finance Committee.*

WM. HOME COOK, *C.A., Auditor.*

# VIEW OF THE INCOME AND EXPENDITURE

## For the Year 1890-91.

### INCOME.

1. ANNUAL SUBSCRIPTIONS AND ARREARS received, . . . . .	£691	17	0
2. LIFE SUBSCRIPTIONS received, . . . . .	548	8	0
	<hr/>		
	£1,240	5	0
3. INTERESTS AND DIVIDENDS received—			
Interests, . . . . .	£1,016	5	9
Dividends, . . . . .	1,591	6	10
	<hr/>		
	2,607	12	7
4. INCOME FROM BUILDING FUND, . . . . .	14	3	5
5. RECEIPTS in connection with former Shows, . . . . .	8	15	0
6. TRANSACTIONS—Sales from Messrs Blackwood & Sons, . . . . .	8	15	2
7. BALANCE OF RECEIPTS from Stirling Show, . . . . .	1,448	16	6
8. SUM received from Government in aid of Agricultural Experiments, . . . . .	150	0	0
9. INVESTIGATION as to Abortion in Cows—Subscriptions, &c., received, . . . . .	72	10	6
	<hr/>		
	£5,550	18	2

### EXPENDITURE.

1. ESTABLISHMENT—			
Salaries and Wages, . . . . .	£1,372	0	0
Fees, duties, Taxes, Coals, Gas, Insurance, . . . . .			
Repairs and Furnishings, . . . . .	114	19	10
	<hr/>		
	£1,486	19	10
2. FEE TO AUDITOR for 1889-90, . . . . .	50	0	0
3. FEE TO PRACTICAL ENGINEER, . . . . .	20	0	0
4. AGRICULTURAL EDUCATION (including Bursaries and Fees to Examiners), . . . . .	267	0	0
5. CHEMICAL DEPARTMENT, . . . . .	573	4	11
6. VETERINARY DEPARTMENT, . . . . .	44	9	0
7. BOTANICAL DEPARTMENT, . . . . .	25	0	0
8. SPECIAL GRANTS, . . . . .	150	0	0
9. TRANSACTIONS, . . . . .	346	18	6
10. ESSAYS AND REPORTS, . . . . .	100	0	0
11. ORDINARY Printing, Advertising, Stationery, Postages, and Bank Charges, . . . . .	179	17	11
12. SUBSCRIPTIONS to Public Societies, . . . . .	25	0	0
13. MISCELLANEOUS, . . . . .	116	2	3
14. PREMIUMS—			
Dundee Show, . . . . .	£174	0	0
Stirling Show, . . . . .	1,807	4	2
District Competitions, . . . . .	339	4	8
Cottages and Gardens, . . . . .	11	3	4
	<hr/>		
	2,331	12	2
15. PAYMENT in connection with former Show, . . . . .	0	2	0
	<hr/>		
	5,716	6	7
BALANCE OF EXPENDITURE, . . . . .	<hr/>		
	£165	8	5

W. S. WALKER, *Treasurer.*

JAMES H. GIBSON-CRAIG, *Vice-Chairman of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 5th January 1892.

# **ABSTRACT of the ACCOUNTS of the ARGYLL NAVAL FUND for 1890-91.**

## **CHARGE.**

1. FUNDS as at 30th November 1890—			
Debenture Stock of the North British Railway Company,	£1,200	0	0
Funded Debt of the Clyde Navigation Trustees, £3,000, purchased at .	2,970	0	0
Stock of the Royal Bank of Scotland, £305, purchased at .	671	0	0
Loan on Heritable Security at 4 per cent, .	1,200	0	0
	<hr/>		
	£6,041	0	0
BALANCE in Royal Bank of Scotland—			
On Deposit Receipt, . . .	£138	16	2
On Current Account, . . .	334	17	4
	<hr/>		
	473	13	6
	<hr/>		
	£6,514	13	6
2. INCOME received—			
On £1,200 North British Railway Company Debenture Stock at 4½ per cent, £51, less tax £1, 5s. 6d., . . .	£49	14	6
On £3,000 Funded Debt of the Clyde Navigation Trustees at 4 per cent, £120, less tax £3, . . .	117	0	0
On £305 Royal Bank Stock, . . .	27	9	0
On £1,200 lent on Heritable Security, at 4 per cent, £48, less tax £1, 4s., . . .	46	16	0
	<hr/>		
	£240	19	6
On Balance in Bank—			
On Deposit Receipt, . . .	£4	4	6
On Current Account, . . .	1	11	11
	<hr/>		
	5	16	5
Income-Tax for three years, repaid by Government,	18	17	10
	<hr/>		
	285	13	9
	<hr/>		
SUM OF CHARGE, . . .	£6,780	7	3

## **DISCHARGE.**

1. ALLOWANCES to the five following Recipients—				
Colin Duncan Lorne MacEwan, first year,	.	.	.	£40 0 0
Godfrey George Webster, second year,	.	.	.	40 0 0
Colin Mackenzie, third year,	.	.	.	40 0 0
C. W. Campbell Strickland, third year,	.	.	.	40 0 0
Edward A. Baird, seventh year,	.	.	.	40 0 0
				<hr/>
				£200 0 0
2. FUNDS as at 30th November 1891—				
Debenture Stock of the North British Railway Company,	£1,200	0	0	
Funded Debt of the Clyde Navigation Trustees, £3,000, purchased at	2,970	0	0	
Stock of the Royal Bank of Scotland, £305, purchased at	671	0	0	
Loan on Heritable Security, at 4 per cent,	1,200	0	0	
				<hr/>
	£6,041	0	0	
Balance in Royal Bank of Scotland—				
On Deposit Receipt,	£255	0	8	
On Current Account,	284	6	7	
				<hr/>
		539	7 3	
				<hr/>
				6,580 7 3
SUM OF DISCHARGE,				
				<hr/>
				£6,780 7 3

W. S. WALKER, *Treasurer.*

JAMES H. GIBSON-CRAIG, *Vice-Chairman of Finance Committee.*

WM. HOME COOK, C.A., *Auditor.*

EDINBURGH, 5th January 1892.

## ABSTRACT of the ACCOUNTS

## CHARGE.

## 1. LOCAL SUBSCRIPTIONS—

## Voluntary Assessment on Proprietors—

Stirlingshire, . . . . .	£309 5 10
Dunbartonshire, . . . . .	213 1 9
Clackmannanshire, . . . . .	53 18 6
Western District of Perthshire, . . . . .	157 17 10
	<u>£734 3 11</u>

## Contributions by—

Stirling Wine, Beer, and Spirit Association, . . . . .	£25 0 0
Cowane's Hospital, Stirling, . . . . .	20 0 0
Common Good of the Burgh of Stirling, . . . . .	5 0 0
	<u>50 0 0</u>
	<u>£784 3 11</u>

## 2. AMOUNT COLLECTED DURING SHOW—

Drawn at Gates, . . . . .	£2,378 14 0
Drawn at Grand Stand, . . . . .	214 4 6
Catalogues and Awards sold, . . . . .	243 1 0
Drawn at Working Dairy, . . . . .	89 18 2
Drawn at Lavatory, . . . . .	4 6 10
	<u>2,930 4 6</u>

3. RENT OF STALLS, . . . . .	1,446 14 6
4. RENT OF REFRESHMENT BOOTHS, . . . . .	200 0 0
5. INCOME FROM TWEEDDALE MEDAL FUND, . . . . .	18 5 8
6. SUBSCRIPTIONS IN AID OF PREMIUMS, . . . . .	106 10 0
7. FINES FOR NON-EXHIBITION OF LIVE STOCK, . . . . .	69 0 0
8. INTEREST FROM ROYAL BANK, . . . . .	5 4 0

BALANCE OF PAYMENTS, . . . . . £5,560 2 7  
358 7 8

Note.—To the above Balance of . . . . . £358 7 8  
There must be added the Premiums  
undrawn at 30th November 1891,  
amounting to . . . . . 207 10 0

MAKING THE PROBABLE LOSS, . . . . . £565 17 8

£5,918 10 3

## of the STIRLING SHOW, 1891.

## DISCHARGE.

1. SHOWYARD EXPENDITURE—				
Fitting up Showyard,	.	.	.	£2,049 10 0
Rent of Park,	.	.	.	100 0 0
Clerk of Works,	.	.	.	13 16 0
Rosettes, Blue Tape, Arm Badges, &c.,	.	.	.	30 14 9
Indicators for Awards,	.	.	.	28 14 6
Railway Carriages and Cartages of Turnstiles, Catalogues, &c.,	.	.	.	5 7 9
Poultry Dishes,	.	.	.	4 5 6
Gratuity to Foremen Workmen,	.	.	.	2 15 0
Miscellaneous,	.	.	.	4 4 4
				£2,239 7 10
2. FORAGE AND BEDDING FOR STOCK,	.	.	.	333 17 3
3. POLICE,	.	.	.	94 7 5
4. TRAVELLING EXPENSES of Judges, Stewards, Secretary, and Assistants (51 in all),	.	.	.	111 17 2
5. ALLOWANCE to 36 Judges for Hotel Expenses, at £4 each,	.	.	.	144 0 0
6. HOTEL AND LODGINGS BILLS—				
31 Directors, 6 Stewards, Secretary, Auditor, and Veterinary Surgeon (including Sitting Rooms and gratuities to servants),	.	.	£143 6 5	
Clerks, Extra Assistants, and Attendants,	.	.	45 3 5	
Luncheon in Committee Room for Judges, Attending Members, and Members of Committee, and Breakfasts for Stewards, Assistants, and Attendants, &c.,	.	.	103 4 0	
Dinners to Sergeants and Piper Boys,	.	.	7 19 6	
				299 13 4
7. BANQUET,	.	.	.	21 0 0
8. MUSIC in Showyard,	.	.	.	55 3 9
9. PRINTING and Lithographing,	.	.	.	174 10 11
10. ADVERTISING and Bill-posting,	.	.	.	85 3 4
11. VETERINARY INSPECTOR,	.	.	.	7 0 0
12. BEE EXHIBITION,	.	.	.	20 17 6
13. PRACTICAL ENGINEER—				
Fees, 13 days at £4, 4s. per day,	.	.	£54 12 0	
Personal and Travelling Expenses,	.	.	15 4 6	
Plan of Showyard and Fittings,	.	.	7 7 0	
				77 3 6
14. WORKING DAIRY—				
Erecting Shed,	.	.	£65 0 0	
Machinery,	.	.	16 12 0	
Hire of Utensils,	.	.	19 17 7	
Milk and Cream,	.	.	36 0 0	
Strawberries and Sugar,	.	.	24 18 4	
Miss Maidment—Fee and Expenses,	.	.	16 4 6	
R. J. Drummond, do.,	.	.	12 12 0	
Assistants,	.	.	16 1 6	
Railway Carriages and Cartages,	.	.	2 13 4	
				209 19 3
15. NEW MILKING MACHINE—				
Erecting Shed,	.	.	£7 10 0	
Allowance to S. Nicholson,	.	.	10 0 0	
Medal to John Gray,	.	.	0 14 0	
Carriage of Cows, &c.,	.	.	2 6 0	
				20 10 0
16. EXTRA CLERKS, Assistants, and Attendants at Turnstiles, Gates, &c.,	.	.	174 19 3	
17. POSTAGES,	.	.	39 15 0	
18. MISCELLANEOUS OUTLAYS,	.	.	2 0 7	
				£4,111 6 1
AMOUNT OF GENERAL EXPENSES,				
19. PREMIUMS drawn at 30th November 1891,	.	.	1,807 4 2	
				£5,918 10 3

W. S. WALKER, *Treasurer.*JAMES H. GIBSON-CRAIG, *Vice-Chairman of Finance Committee.*WM. HOME COOK, C.A., *Auditor.*



# APPENDIX (B).

## PREMIUMS

OFFERED BY

### THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND IN 1892.

#### CONTENTS.

	PAGE
GENERAL NOTICE . . . . .	3
CONSTITUTION AND MANAGEMENT . . . . .	4
ESTABLISHMENT FOR 1892 . . . . .	5
MEETINGS FOR 1892 . . . . .	7
COMMITTEES . . . . .	8
AGRICULTURAL EDUCATION . . . . .	11
VETERINARY DEPARTMENT . . . . .	22
FORESTRY DEPARTMENT . . . . .	22
CHEMICAL DEPARTMENT . . . . .	27
BOTANICAL DEPARTMENT . . . . .	43
DAIRY DEPARTMENT . . . . .	44
GENERAL REGULATIONS FOR COMPETITORS . . . . .	45

#### CLASS I.—REPORTS.

##### § 1. THE SCIENCE AND PRACTICE OF AGRICULTURE—FOR APPROVED REPORTS ON—

1. Experiments for fixing the ingredients in Farmyard Manure . . . . .	46
2. Manures produced by different kinds of Feeding . . . . .	46
3. Hardy and useful Herbaceous Plants of any Country . . . . .	46
4. Comparative advantages of Feeding Home-bred or Canadian Cattle . . . . .	47
5. Comparative Advantages of Fattening Cattle in Stalls, &c. . . . .	47
6. Different descriptions of Food for Stock . . . . .	47
7. Dairy Management . . . . .	48
8. Comparative Feeding Value of Ensilage . . . . .	48
9. Rural Economy abroad susceptible of being introduced into Scotland . . . . .	48



## § 2. ESTATE IMPROVEMENTS—FOR APPROVED REPORTS ON—

1. General Improvement of Estates by Proprietors . . . . .	48
2. Most approved Farm Buildings by Proprietors . . . . .	48
3, 4, and 5. Reclamation of Waste Land by Proprietors or Tenants . . . . .	48
6 and 7. Improvement of Natural Pasture by Proprietors or Tenants . . . . .	49

## § 3. HIGHLAND INDUSTRIES AND FISHERIES—FOR APPROVED REPORTS ON—

1. Mode of treating native Wool . . . . .	49
2. Utilising the Sprat Fisheries . . . . .	49

## § 4. MACHINERY—FOR APPROVED REPORTS.

## § 5. FORESTRY DEPARTMENT—FOR APPROVED REPORTS ON—

1. Planting on Peat Bog . . . . .	50
2. Forest Trees of recent introduction . . . . .	50
3. Insects injurious to British Forest Trees . . . . .	50

## CLASS II.—DISTRICT COMPETITIONS.

1. STOCK . . . . .	51
2. DAIRY PRODUCE . . . . .	54
3. SPECIAL GRANTS . . . . .	54
4. MEDALS in aid of Premiums given by Local Societies . . . . .	54
5. PLOUGHING COMPETITIONS . . . . .	57

## CLASS III.—COTTAGES AND GARDENS.

1. PREMIUMS for BEST KEPT COTTAGES and GARDENS . . . . .	58
2. MEDALS for COTTAGES and GARDENS or GARDEN PRODUCE . . . . .	59
3. IMPROVING EXISTING COTTAGES . . . . .	61
4. BUILDING NEW COTTAGES . . . . .	61

GENERAL SHOW AT INVERNESS IN 1892 . . . . .	63
---	----

LIST OF MEMBERS ADMITTED SINCE APRIL 1891 . . . . .	85
---	----

## GENERAL NOTICE.

---

THE HIGHLAND SOCIETY was instituted in the year 1784, and incorporated by Royal Charter in 1787. Its operation was at first limited to matters connected with the improvement of the Highlands of Scotland; but the supervision of certain departments, proper to that part of the country, having been subsequently committed to special Boards of Management, several of the earlier objects contemplated by the Society were abandoned, while the progress of agriculture led to the adoption of others of a more general character. The exertions of the Society were thus early extended to the whole of Scotland, and have, for the greater part of a century, been directed to the promotion of the science and practice of agriculture in all its branches.

In accordance with this more enlarged sphere of action, the original title of the Society was altered, under a Royal Charter, in 1834, to THE HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

The leading purposes of the Institution are set forth in the following pages, where it will be found that Premiums are offered for Reports on almost every subject connected with the cultivation of the soil; the rearing and feeding of stock; the management of the dairy; the improvement of agricultural machinery and implements; the growth of timber; the extension of cottage accommodation; the application of chemical science; and the dissemination of veterinary information.

Among the more important measures which have been effected by the Society are—

1. Agricultural Meetings and General Shows of Stock, Implements, &c., held in the principal towns of Scotland, at which exhibitors from all parts of the United Kingdom are allowed to compete.

2. A system of District Shows instituted for the purpose of improving the breeds of Stock most suitable for different parts of the country, and of aiding and directing the efforts of Local Agricultural Associations.

3. The encouragement of Agricultural Education, under powers conferred by a supplementary Royal Charter, granted in 1856, and authorising "THE COUNCIL of the HIGHLAND AND AGRICULTURAL SOCIETY ON EDUCATION" to grant Diplomas to Students of Agriculture; and by the establishment of Bursaries.

4. The appointment of a chemist for the purpose of promoting the application of science to agriculture, and to superintend local experiments. Also to subsidise, under certain conditions, Local Analytical Associations.

5. The advancement of the Veterinary Art, by conferring Certificates on Students who have passed through a prescribed curriculum, and who are found, by public examination, qualified to practise. Now terminated in accordance with arrangements with the Royal College of Veterinary Surgeons.

6. The establishment of a Botanical Department.

7. The establishment of a Dairy Department.

8. The appointment of a Board of Examiners, and the granting of First and Second Class Certificates in Forestry.

9. The annual publication of the 'Transactions,' which comprehend the Prize Reports, and reports of experiments, also an abstract of the business at Board and General Meetings, and other communications.

10. The management of a fund left by John, 5th Duke of Argyll (the original President of the Society) to assist young natives of the Highlands who enter Her Majesty's Navy.

## CONSTITUTION AND MANAGEMENT.

THE general business of the HIGHLAND AND AGRICULTURAL SOCIETY is conducted under the sanction and control of a Royal Charter, which authorises the enactment of Bye-Laws. Business connected with Agricultural Education is conducted under the authority of a supplementary Royal Charter, also authorising the enactment of Bye-Laws.

The Office-Bearers consist of a President, Four Vice-Presidents, Thirty-two Ordinary and Twenty Extraordinary Directors, a Treasurer, an Honorary and an Acting Secretary, an Auditor, and other Officers.

The Directors meet on the first Wednesday of each month from November to June; seven being a quorum. The proceedings of the Directors are reported to General Meetings of the Society, held in January and in June or July.

With reference to motions at General Meetings, Bye-Law No. 10 provides—“That at General Meetings of the Society no motion or proposal (except of mere form or courtesy) shall be submitted or entertained for immediate decision unless notice thereof has been given a week previously to the Board of Directors, without prejudice, however, to the competency of making such motion or proposal to the effect of its being remitted to the Directors for consideration, and thereafter being disposed of at a future General Meeting.”

The Council on Education, under the Supplementary Charter, consists of Sixteen Members—Nine nominated by the Charter, and Seven elected by the Society. The Board of Examiners consists of Sixteen Members.

Candidates for admission to the Society must be proposed by a Member, and are elected at the half-yearly General Meetings in January and June or July, but it is not necessary that the proposer should attend the meeting. The ordinary subscription is £1, 3s. 6d. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £7, 1s. to £12, 12s. Proprietors farming the whole of their own lands, whose rental on the Valuation Roll does not exceed £500 per annum, and all Tenant-Farmers, Secretaries or Treasurers of Local Agricultural Associations, Factors resident on Estates, Land-Stewards, Foresters, Agricultural Implement Makers, and Veterinary Surgeons, none of them being also owners of land to an extent exceeding £500 per annum, are admitted on a subscription of 10s. annually, which may be redeemed by one payment, varying, according to the number of previous annual payments, from £3 to £5, 5s. Subscriptions payable on election, and afterwards annually in January. According to the Charter, a Member who homologates his election by paying his first subscription cannot retire until he has paid in annual subscriptions, or otherwise, an amount equivalent to a life composition—namely, £12, 12s. or £5, 5s. Members having candidates to propose are requested to state whether the candidate should be on the £1, 3s. 6d. or 10s. list.

Members of the Society receive the ‘Transactions’ free on application to the Secretary, and are entitled to consult the Chemist and Botanist at reduced rates—to apply for District Premiums—to report Ploughing Matches for the Medal—to free admission to the Showyard, and to exhibit Stock and Implements at reduced rates. Firms are not admitted as Members, but if one partner of a firm becomes a Member, the firm is allowed to exhibit at Members’ rates.

Orders, payable at the Royal Bank of Scotland, Edinburgh, are issued by the Directors, in name of the persons in whose favour Premiums have been awarded.

All communications must be addressed to “FLETCHER NORTON MENZIES, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.”

## ESTABLISHMENT FOR 1892.

---

### President.

SIR GEORGE MACPHERSON GRANT of Ballindalloch, Bart.

### Vice-Presidents.

DONALD CAMERON of Lochiel, Achnacarry, Fort-William.  
 SIR KENNETH S. MACKENZIE of Gairloch, Bart., Conan House, Ross-shire.  
 JOHN M. MARTIN of Auchendennan, Alexandria, N.B.  
 CHARLES HOWATSON of Glenbuck, Glenbuck.

### Ordinary Directors.

SIR JAMES R. G. MAITLAND of Barnton, Bart., Craigend, Stirling.  
 J. H. TURNER, Portland Estate Office, Kilmarnock.  
 JOHN BALLINGALL, Dunbog, Newburgh, Fife.  
 WILLIAM FORD, Fentonbarns, Drem.  
 W. H. LUMSDEN of Balmedie, Aberdeen.  
 W. J. MAXWELL, yr. of Munches, Terraughtie, Dumfries.  
 DUNCAN FORBES of Culloden, Inverness.  
 R. SHIRRA GIBB, Boon, Lauder.  
 SIR JOHN STIRLING MAXWELL of Pollok, Bart., Pollokshaws.  
 JOHN GILMOUR of Montrave, Leven, Fife.  
 DONALD FISHER, Jellyholm, Alloa.  
 R. G. WARDLAW RAMSAY of Whitehill, Tillicoultry House, Tillicoultry.  
 G. WILKEN, Waterside of Forbes, Alford, N.B.  
 JAMES LOCKHART, Mains of Aries, Stranraer.  
 JOHN CRAN, Kirkton, Bunchrew, Inverness.  
 THE HON. THE MASTER OF POLWARTH, Humbie House, Upper Keith.  
 PATRICK STIRLING of Kippendavie, Dunblane.  
 ROBERT ANDERSON of Lochdhu, Nairn.  
 GEORGE R. GLENDINNING, Hatton Mains, Wilkieston.  
 ALEXANDER M. GORDON of Newton, Inch, Aberdeenshire.  
 JOHN M. AITKEN, Norwood, Lockerbie.  
 W. S. FERGUSON, Pictstonhill, Perth.  
 DAVID M'GIBBON, Ardnacraig, Campbelltown.  
 WALTER ELLIOT, Hollybush, Galashiels.  
 R. SINCLAIR SCOTT, Craigievar, Skelmorlie.  
 SIR ROBERT MENZIES of Monzie, Bart., Farleyer, Aberfeldy.  
 ROBERT PATERSON, Hill of Drip, Stirling.  
 SIR JAMES H. GIBSON-CRAIG of Riccarton, Bart., Currie.  
 JOHN MARR, Cairnbrogie, Old Meldrum.  
 REV. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.  
 JONATHAN MIDDLETON, Clay of Allan, Fearn.  
 JAMES T. S. ELLIOT of Wolflee, Hawick.

### Extraordinary Directors.

THE MACKINTOSH of MACKINTOSH, Moy Hall, Inverness.  
 SIR KENNETH MATTHEW of Ardross, Bart., Hedgefield House, Inverness.  
 ENEAS W. MACKINTOSH of Raigmore, Inverness.

Major ROSE of Kilravock, Fort-George Station.  
 Major RANDLE JACKSON of Swordale, Evanton, Ross-shire.  
 J. DOUGLAS FLETCHER of Rosehaugh, Inverness.  
 ALEXANDER ROSS, Provost of Inverness.  
 JOHN MILLER of Scrabster, Thurso.  
 JAMES BLACK of Sheriffston, Elgin.  
 DONALD M'LEAN, Dunrobin, Golspie.  
 Sir ALLAN R. MACKENZIE of Glenmuick, Bart., Ballater.  
 GEORGE J. WALKER, Portlethen, Aberdeen.  
 JOHN KERR, Broomhouse, Corstorphine.  
 JAMES M'QUEEN of Crofts, Dalbeattie.  
 Captain D. G. CLAYHILLS HENDERSON of Invergowrie, R.N., Dundee.  
 DAVID BUTTAR, Corston, Coupar-Angus.  
 ALEXANDER MURDOCH, Garteraig, Shetleston.  
 CAMPBELL MACPHERSON GRANT of Drumduan, Forres.  
 ANDREW MACKENZIE, Dalmore, Alness, N.B.  
 ALEXANDER MACDUFF of Bonhard, Perth.

### Office-Beaters.

Sir WILLIAM STUART WALKER, K.C.B., *Treasurer*.  
 Sir G. GRAHAM MONTGOMERY of Stanhope, Bart., *Honorary Secretary*.  
 FLETCHER NORTON MENZIES, *Secretary*.  
 Rev. ARCHIBALD SCOTT, D.D., *Chaplain*.  
 ANDREW P. AITKEN, D.Sc., *Chemist*.  
 WILLIAM HOME COOK, C.A., *Auditor*.  
 TODS, MURRAY, & JAMIESON, W.S., *Law Agents*.  
 A. N. M'ALPINE, *Consulting Botanist*.  
 JAMES D. PARK, *Practical Engineer*.  
 THOMAS DUNCAN, *Recorder and Clerk*.  
 JOHN MACDIARMID, *Second Clerk*.  
 GOURLAY STEELL, R.S.A., *Animal Portrait Painter*.  
 WILLIAM WILLIAMS, F.R.C.V.S., *Professor of Veterinary Surgery*.  
 THOMAS WALLEY, M.R.C.V.S., *Professor of Cattle Pathology*.  
 WILLIAM BLACKWOOD & SONS, *Printers and Publishers*.  
 G. WATERSTON & SONS, *Stationers*.  
 JAMES CRICHTON & Co., *Silversmiths and Medallists*.  
 JOHN WATHERSTON & SONS, *Inspectors of Works*.  
 WILLIAM SIMPSON, *Messenger*.

### Chairmen of Committees.

- |   |  |
|---|--|
| 1. <i>Argyll Naval Fund,</i>                                      | Lord ELPHINSTONE, Carberry Tower, Musselburgh.           |
| 2. <i>Chemical and Botanical,</i>                                 | G. R. GLENDINNING, Hatton Mains, Wilkie-ston.            |
| 3. <i>Dairy,</i>  | JAMES M'QUEEN of Crofts, Dalbeattie.                     |
| 4. <i>District Shows, and Cottages and Gardens,</i>               | W. H. LUMSDEN of Balmedie, Aberdeen.                     |
| 5. <i>Finance, Hall and Chambers, and Law,</i>                    | JAMES AULDJO JAMIESON, W.S., 66 Queen Street, Edinburgh. |
| 6. <i>Forestry and Highland Industries,</i>                       | Sir ROBERT MENZIES, Bart., Farleyer, Aberfeldy.          |
| 7. <i>General Shows,</i>  | Sir JAMES H. GIBSON-CRAIG, Bart.                         |
| 8. <i>Machinery,</i>  | JONATHAN MIDDLETON, Clay of Allan, Fearn.                |
| 9. <i>Publications, Ordnance Survey, and Reports of Meetings,</i> | Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.    |
| 10. <i>Veterinary,</i>  | R. G. WARDLAW RAMSAY of Whitehill.                       |

**General Meetings.**—By the Charter the Society must hold two General Meetings each year, and, under ordinary circumstances, they are held on the third Wednesday of the months of January and June, at one o'clock, in the Society's Hall, 3 George IV. Bridge, for the election of Members and other business.

**Meeting at Inverness.**—By a resolution of the General Meeting on 15th January 1879, a General Meeting of Members is held in the Show-yard on the occasion of the Annual Show. This year it will be held at Inverness, on Wednesday, 27th July, at 11.30 A.M.

**General Show at Inverness**—26th, 27th, 28th, and 29th July.  
—Entries close for Implements, 23d May—Stock, Poultry, and Dairy Produce, 20th June.

**Directors' Meetings.**—The Board of Directors meet on the first Wednesday of each month from November till June inclusive, at one P.M., and occasionally as business may require, on a requisition by three Directors to the Secretary, or on intimation by him.

**Nomination of Directors.**—Meetings of Members, for the purpose of nominating Directors to represent the Show Districts on the Board, will be held at the places and on the days after mentioned :—

1. Glasgow, North British Station Hotel, . . . Wednesday, 3d Aug., at 1.
2. Perth, Salutation Hotel, . . . . . Friday, 5th August, at 2.
3. Stirling, Golden Lion Hotel, . . . . . Friday, 19th August, at 1.
4. Edinburgh, 3 George IV. Bridge, . . . . . Wednesday, 24th Aug., at 2.
5. Aberdeen, Imperial Hotel, . . . . . Friday, 26th Aug. at 12.
6. Dumfries, King's Arms Hotel, . . . . . Wednesday, 31st Aug., at 1.
7. Inverness, Caledonian Hotel, . . . . . Friday, 2d Sept., at 12.30.
8. Kelso, Secretary's Tent, Ram Sale Ground, . . . . . Friday, 9th Sept., at 1.

The nomination of Proprietors or other Members paying the higher subscription must be made in the 3d, 5th, 6th, and 7th Districts ; and the nomination of Tenant-Farmers or other Members paying the lower subscription, in the 1st, 2d, 4th, and 8th Districts.

### Committee Meetings.

**Forestry and Highland Industries.**—First Tuesday in November at 12.30 noon.

**Machinery.**—First Tuesday in November, at 1.15 P.M.

**General Shows.**—First Tuesday in November, at 2 P.M.

**Publications, Ordnance Survey, and Reports of Meetings.**—First Wednesday in January, at 12 noon, and first Wednesday in November, at 12 noon.

**District Shows, and Cottages and Gardens.**—First Tuesday in December, at 12 noon.

**Chemical and Botanical.**—First Tuesday in March, and first Tuesday in December, at 2 P.M.

The other Standing Committees—**ARGYLL NAVAL FUND ; FINANCE, HALL AND CHAMBERS, AND LAW ; DAIRY AND VETERINARY,** meet when required.

**Examinations for the Society's Diploma and Certificate in Agriculture and Certificates in Forestry** are fixed to be held on the 23d, 24th, and 25th March.

**Examinations for the Society's Bursaries** are held annually in October.

## COMMITTEES FOR 1892.

### 1. ARGYLL NAVAL FUND.

Lord ELPHINSTONE, Carberry Tower, Musselburgh, *Convener*.  
 Sir DAVID BAIRD of Newbyth, Bart., Prestonkirk.  
 DUNCAN FORBES of Culloden, Inverness.  
 Captain G. D. CLATHILLS HENDERSON of Invergowie, R.N., Dundee.

### 2. CHEMICAL AND BOTANICAL.

G. R. GLENDINNING, Hatton Mains, Wilkieston, *Convener*.  
 R. SHIRRA GIBB, Boon, Lauder, *Vice-Convener*.  
 THE MASTER OF POLWARTH, Humble House, Upper Keith.  
 JOHN M. AITKEN, Norwood, Lockerbie.  
 Prof. BAYLEY BALFOUR, Inverleith House.  
 DAVID BUTTAR, Corston, Coupar-Angus.  
 Dr CLEGHORN of Stravithy, St Andrews.  
 W. S. FERGUSON, Pictstonhill, Perth.  
 GEORGE HENDERSON, Upper Keith.  
 JOHN MARR, Cairnbrogie, Old Meldrum.  
 JONATHAN MIDDLETON, Clay of Allan, Fearn, Ross-shire.  
 JAMES M'QUEEN of Crofts, Dalbeattie.  
 R. G. WARDLAW RAMSAY of Whitehill.  
 JOHN SPEIR, Newton Farm, Newton, Glasgow.  
 DAVID WILSON, yr. of Carbeth, Killearn.  
 Dr AITKEN, Chemist, *ex officio*.  
 A. N. M'ALPINE, Botanist, *ex officio*.

### 3. DAIRY.

JAMES M'QUEEN of Crofts, Dalbeattie, *Convener*.  
 ANDREW ALLAN, Munnoch, Dalry, Ayr.  
 Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.  
 W. J. MAXWELL, yr. of Munches, Terranghtie, Dumfries.  
 J. H. TURNER, Portland Estate Office, Kilmarnock.  
 JAMES LOCKHART, Mains of Airies, Stranraer.  
 ANDREW RALSTON, Glamis House, Forfar.  
 AUGUSTUS W. CRUIKSHANK, of Langley Park, Montrose.  
 ROBERT PATERSON, Hill of Drip, Stirling.  
 JOHN M. AITKEN, Norwood, Lockerbie.  
 Dr AITKEN, Chemist, 8 Clyde Street, Edinburgh.

### 4. DISTRICT SHOWS, AND COTTAGES AND GARDENS.

W. H. LUMSDEN of Balmedie, Aberdeen, *Convener*.  
 THE MASTER OF POLWARTH, Humble House, Upper Keith, *Vice-Convener*.  
 DAVID BUTTAR, Corston, Coupar-Angus.  
 JOHN BALLINGALL, Dunbog, Newburgh, Fife.  
 JOHN CRAN, Kirkton, Bunchrew, Inverness.

WALTER ELLIOT, Hollybush, Galashiels.  
 G. R. GLENDINNING, Hatton Mains, Wilkieston.  
 CHARLES HOWATSON, House of Glenbuck, Glenbuck.  
 ALEX. MURDOCH, Gartcraig, Shettleston.  
 JAMES T. S. ELLIOT of Wolfelee, Hawick.  
 W. S. FERGUSON, Pictstonhill, Perth.  
 DAVID M'GIBBON, Ardnacraig, Campbelltown.  
 JOHN CRAIG, Innergeldie, Comrie.  
 J. D. FLETCHER of Rosehaugh, Inverness.  
 WILLIAM FORD, Fentonbarns, Drem.  
 JAMES LOCKHART, Mains of Airies, Strathraer.

## 5. FINANCE, HALL AND CHAMBERS, AND LAW.

JAMES AULDJO JAMIESON, W.S., 66 Queen Street, Edinburgh, *Convener*.  
 Sir JAMES H. GIBSON-CRAIG of Riccarton, Bart., *Vice-Convener*.  
 Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.  
 A. M. GORDON of Newton, Inch, Aberdeen.  
 ALEX. MACDUFF of Bonhard, Perth.  
 W. J. MAXWELL, yr. of Munches, Terraughtie, Dumfries.  
 PATRICK STIRLING of Kippendavie, Dunblane.  
 Sir WILLIAM S. WALKER, K.C.B., 5 Manor Place, *ex officio*.  
 Sir G. GRAHAM MONTGOMERY of Stanhope, Bart., Stobo Castle, *ex officio*.  
 WILLIAM HOME COOK, C.A., Auditor, *ex officio*.

## 6. FORESTRY AND HIGHLAND INDUSTRIES.

Sir ROBERT MENZIES, Bart., Farleyer, Aberfeldy, *Convener*.  
 Sir ALLAN R. MACKENZIE of Glenmuick, Bart., Ballater.  
 Sir JAMES R. G. MAITLAND of Barnton, Bart., Craigend, Stirling.  
 WILLIAM ANDERSON SMITH, Ledaig, Argyllshire.  
 Dr CLEGHORN of Stravithy, St Andrews.  
 DUNCAN FORBES of Culloden, Inverness.  
 C. MACPHERSON GRANT of Drumduan, Forres.  
 JOHN METHVEN, 15 Princes Street, Edinburgh.  
 Sir ALEXANDER MUIR MACKENZIE of Dalvine, Bart., Dunkeld.  
 JOHN MILLER of Scabster, Thurso.

## 7. GENERAL SHOWS.

Sir JAMES H. GIBSON-CRAIG of Riccarton, Bart., Currie, *Convener*.  
 Sir ALLAN R. MACKENZIE of Glenmuick, Bart., Ballater, *Vice-Convener*.  
 Sir ROBERT MENZIES, Bart., Farleyer, Aberfeldy.  
 PATRICK STIRLING of Kippendavie, Dunblane.  
 DAVID BUTTAR, Corston, Coupar-Angus.  
 JOHN CRAN, Kirkton, Bunchrew, Inverness.  
 WALTER ELLIOT, Hollybush, Galashiels.  
 WILLIAM FORD, Fentonbarns, Drem.  
 Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O.  
 JOHN GILMOUR of Montrave, Leven.  
 C. MACPHERSON GRANT of Drumduan, Forres.  
 CHARLES HOWATSON, House of Glenbuck, Glenbuck.  
 W. H. LUMSDEN of Balmedie, Aberdeen.  
 ALEX. MACDUFF of Bonhard, Perth.  
 ANDREW MACKENZIE, Dalmore, Alness.  
 JAMES M'QUEEN of Crofts, Dalbeattie.  
 JOHN MARR, Cairnbrogie, Old Meldrum.  
 W. J. MAXWELL, yr. of Munches, Terraughtie, Dumfries.  
 ALEX. MURDOCH, Gartcraig, Shettleston.  
 J. H. TURNER, Portland Estate Office, Kilmarnock.  
 JAMES LOCKHART, Mains of Airies, Strathraer.



G. WILKEN, Waterside of Forbes, Alford, N.B.  
 The Hon. THE MASTER OF POLWARTH, Humble House, Upper Keith.  
 JONATHAN MIDDLETON, Clay of Allan, Fearn.  
 JOHN KERR, Broomhouse, Corstorphine.  
 JOHN M. MARTIN of Auchendennan.  
 GEORGE J. WALKER, Portlethen, Aberdeen.  
 DAVID M'GIBBON, Ardnacraig, Campbeltown.  
 R. SINCLAIR SCOTT, Craigievar, Skelmorlie.  
 J. T. S. ELLIOT of Wolfelee, Hawick.  
 JAMES D. PARK, Engineer, *ex officio*.

### 8. MACHINERY.

JONATHAN MIDDLETON, Clay of Allan, Fearn, *Convener*.  
 JOHN SCOTT DUDGEON, Longnewton, St Boswells.  
 WALTER ELLIOT, Hollybush, Galashiels.  
 DONALD FISHER, Jellyholm, Alloa.  
 JOHN KEMP, Stirling.  
 A. S. LOGAN, Ferney Castle, Reston.  
 JOHN MARSHALL, Maybole.  
 J. T. S. PATERSON, 55 Grange Loan, Edinburgh.  
 JOHN YOUNG, jun., Ayr.  
 R. SHIRRA GIBB, Boon, Lauder.  
 G. R. GLENDINNING, Hatton Mains, Wilkieston.  
 JOHN KERR, Broomhouse, Corstorphine.  
 JAMES D. PARK, Engineer, *ex officio*.

### 9. PUBLICATIONS, ORDNANCE SURVEY, AND REPORTS OF MEETINGS.

Rev. JOHN GILLESPIE, Mouswald Manse, Ruthwell, R.S.O., *Convener*.  
 R. SCOT SKIRVING, 29 Drummond Place, Edinburgh, *Vice-Convener*.  
 Dr A. P. AITKEN, 8 Clyde Street, Edinburgh.  
 Dr CLEGHORN of Stravithy, St Andrews.  
 J. T. S. ELLIOT of Wolfelee, Hawick.  
 A. F. IRVINE of Drum.  
 C. J. MACKENZIE of Portmore, Eshiels, Peebles.  
 R. G. WARDLAW RAMSAY of Whitehill.

### 10. VETERINARY.

R. G. WARDLAW RAMSAY of Whitehill, *Convener*.  
 Sir JAMES H. GIBSON-CRAIG of Riccarton, Bart.  
 WALTER ELLIOT, Hollybush, Galashiels.  
 WILLIAM FORD, Fentonbarns, Drem.  
 G. R. GLENDINNING, Hatton Mains, Wilkieston.  
 JOHN KERR, Broom House, Corstorphine.  
 ALEX. M. GORDON of Newton, Inch, Aberdeenshire.  
 JOHN GILMOUR of Montrave, Leven.  
 ANDREW MACKENZIE, Dalmore, Alness.  
 PATRICK STIRLING of Kippendavie, Dunblane.  
 GEORGE J. WALKER, Portlethen, Aberdeen.  
 Professor WILLIAMS, *ex officio*.

The President, Vice-Presidents, the Treasurer, and Honorary Secretary are members *ex officio* of all Committees.

# AGRICULTURAL EDUCATION.

## CERTIFICATE AND DIPLOMA IN AGRICULTURE.

### COUNCIL ON EDUCATION.

By a Supplementary Charter under the Great Seal, granted in 1856, the society is empowered to grant Diplomas.

#### *Members of Council named by Charter.*

The PRESIDENT of the HIGHLAND AND AGRICULTURAL SOCIETY— <i>President.</i>	
The LORD JUSTICE-GENERAL— <i>Vice-President.</i>	
The LORD ADVOCATE.	The PROFESSOR OF BOTANY.
The DEAN OF FACULTY.	The PROFESSOR OF CHEMISTRY.
The PROFESSOR OF AGRICULTURE.	The PROFESSOR OF NATURAL
The PROFESSOR OF ANATOMY.	HISTORY.

#### *Members of Council nominated by Society.*

MASTER OF POLWARTH.	Rev. JOHN GILLESPIE, Mous-
Sir JAMES H. GIBSON-CRAIG of	wald, Ruthwell, R.S.O.
Riccarton, Bart.	J. M. MARTIN of Auchendennan,
R. G. WARDLAW RAMSAY of	Alexandria, N.B.
Whitehill.	JOHN MARR, Cairnbrogie, Old
W. J. MAXWELL, yr. of Munches,	Meldrum.
Terraughtie, Dumfries.	

#### *Board of Examiners.*

1. *Science and Practice of Agriculture.*—Professor WALLACE, University, Edinburgh; JAMES HOPE, East Barns, Dunbar; JAS. BIGGAR, yr. of Chapelton, Dalbeattie; and Professor WRIGHT, Glasgow and West of Scotland Technical College, 38 Bath Street, Glasgow.
2. *Botany.*—Dr CLEGHORN of Stravithy, St Andrews, and A. N. M'ALPINE, Edinburgh.
3. *Chemistry.*—Dr A. P. AITKEN, Edinburgh, and Dr WILLIAM CRAIG, Edinburgh.
4. *Natural History.*—Professor COSSAR EWART, Edinburgh, and Dr RAMSAY H. TRAQUAIR, Edinburgh.
5. *Veterinary Science.*—Professor WILLIAMS, Edinburgh, and FINLAY DUN, F.R.C.V.S., Edinburgh.
6. *Field-Engineering.*—DAVID ALAN STEVENSON, C.E., Edinburgh, and A. W. BELFRAGE, C.E., Edinburgh.
7. *Book-keeping.*—WILLIAM HOME COOK, C.A., Edinburgh, and J. WILSON BRODIE, C.A., Edinburgh.

#### *Standing Acting Committee.*

The LORD JUSTICE-GENERAL— <i>Convener.</i>	
The PROFESSOR OF AGRICULTURE.	Rev. JOHN GILLESPIE of Mouswald.
The PROFESSOR OF BOTANY.	R. G. WARDLAW RAMSAY of
The PROFESSOR OF CHEMISTRY.	Whitehill.

## BYE-LAWS.

I. That, in terms of the Charter, the Society shall nominate seven members to act on the Council on Education.

II. That the Council shall appoint a Board of Examiners on the following subjects :—Science and Practice of Agriculture ; Botany ; Chemistry ; Natural History ; Veterinary Science ; Field Engineering ; and Book-keeping.

III. That the examinations shall be both written and oral, that the value of the answers shall be determined by numbers, and that the oral examinations shall be public.

IV. That there shall be two examinations,<sup>1</sup> to be styled respectively the "First-Class Certificate Examination" and the "Diploma Examination."

V. That to pass the "First-Class Certificate Examination," a candidate must be acquainted with the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field-engineering, and book-keeping ; and that a certificate in the following terms, bearing the corporate seal and arms of the Society, signed by the President or Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination :—

"These are to certify that on the \_\_\_\_\_, A. B. was examined, and has been found to possess a knowledge of the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field-engineering, and book-keeping."

VI. That to pass the "Diploma Examination," a candidate must possess a *thorough knowledge* of the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field-engineering, and book-keeping ; and that a diploma in the following terms, bearing the corporate seal and arms of the Society, and signed by the President and Vice-President of the Council on Education, the Examiners, and by the Secretary, shall be granted to candidates passing this examination :—

"These are to certify that on the \_\_\_\_\_, A. B. was examined, and has been found to be proficient in the science and practice of agriculture, botany, chemistry, natural history, veterinary science, field-engineering, and book-keeping."

VII. That each successful candidate for the Society's Agricultural Diploma shall thereby become eligible to be elected a free life member of the Society.

VIII. That five bursaries of £20 each shall be open for competition the subjects of examination being the ordinary branches of an English education, the method and standard of examination to be determined by the Directors. Each candidate shall make a written declaration before being examined that it is his intention to pursue Agriculture as a business. £10 shall be paid to each holder of the bursaries on 1st March, on presentation of a certificate from the professor or teacher that he has regularly attended up to that date and obtained a certificate of at least 60 per cent in the class examinations, the class of Agriculture in the University of Edinburgh, the Technical College, Glasgow, or such other class as may be approved and sanctioned by the Board of Directors ; the remaining £10 shall not be paid unless and until the bursar is awarded the Diploma of the Society, either at the close of the session or twelve months thereafter.

<sup>1</sup> The examinations will be held this year on the 23d, 24th, and 25th March, candidates being required to lodge intimation before the 16th of March.

The Regulations for the Examination of Candidates for Bursaries, and Examination Papers, 1891, will be found on pages 20-22.

IX. That a Standing Acting Committee of the Council on Agricultural Education shall be appointed by the Directors.

*Note.*—The list of Diploma Free Life Members is published in vol. iii., fifth series, of the Society's 'Transactions.'

The following have obtained

FIRST-CLASS CERTIFICATES.

- |   |  |
|---|--|
| 1867. *J. C. BOWSTEAD, Halkthorpe Hall, Penrith.          | 1884. *W. STIRLING, Dean's Court, St Andrews.                                    |
| 1868. JAMES TAYLOR, Clashfarquhar, Aberdeen.              | 1885. *HENRY CHAYASSE, Castle Townshend, Cork.                                   |
| 1873. *R. C. B. WILLIS, Cheltenham.                       | 1885. A. R. DUNNET, Auchengill, Keiss, Caithness.                                |
| 1875. GEORGE H. CATT, 44 Middle Street, Brighton.         | 1885. ALEX. EDWARD, 1 Macdonald Street, Dundee.                                  |
| 1875. ROBERT EWING, Reporter, late Edinburgh.             | 1885. JOHN M. RAMSAY, Hope Park, Cupar-Fife.                                     |
| 1875. JOHN SCOTT, Edinburgh.                              | 1886. *BASIL S. CAVE, Queensberry House, Richmond, Surrey.                       |
| 1876. CECIL C. BAKER, 2 Bloomsbury Place, London.         | 1886. *EDGAR DUDLEY, 37 Thornhill Road, Barnsbury, London.                       |
| 1876. *PERCY H. CATHCART, 16 Oakley Square, London.       | 1886. JOHN EDWIN MACKENZIE, 15 Albany Street, Edinburgh.                         |
| 1876. JOHN M'CAIG, Kilhilt, Stranraer.                    | 1886. *J. RENNIE, Wellcroft, Helensburgh.  |
| 1876. C. E. M. RUSSELL, Ballielisk, Dollar.               | 1886. *WILLIAM R. RICHARDSON, Collyhurst Lodge, Whalley Range, Manchester.       |
| 1878. W. M. ANDERSON, Pirntaton, Stow.                    | 1886. *C. G. FREER THONGER, Lordswood Place, Harborne, Staffordshire.            |
| 1879. *M. FALCON, Stainburn, Workington.                  | 1887. *KHOSHEROO B. JADHAVA, Baroda, Bombay.                                     |
| 1880. WILLIAM BROWN, Watten Main, Caithness.              | 1887. *PANDIT SRILAL, Misra, Mahaban, Dist. Muthra, North-West Provinces, India. |
| 1880. ALEX. INGLIS, Tynninghame, Prestonkirk.             | 1888. D. W. COLLYER, Craignethan, Weston-super-Mare, Somerset.                   |
| 1880. JAMES M'LAGGAN, Cobbleheugh, Dinnet, Aberdeenshire. | 1888. F. O. SOLOMON, Southfield, Dartford, Kent.                                 |
| 1880. R. A. MALLOCH, Balhaldie, Braco, Perthshire.        | 1888. W. H. A. T. WATSON, 65 Eccleston Square, London, W.                        |
| 1881. DANIEL BAIN, Wick.                                  | 1889. *ASH RUDD, East Ruston Hall, Stalham, Norwich.                             |
| 1881. *ALFRED HARDIE, Oxford House, Stockport.            | 1889. A. W. WOODBURN, 6 Sardinia Terrace, Hillhead, Glasgow.                     |
| 1882. DANIEL FINLAYSON, Carter's, Seedsman, London.       | 1890. GEORGE CRUICKSHANK, Comisty, Huntly.                                       |
| 1882. BENJAMIN HEPBURN, Preston Mains, Prestonkirk.       | 1890. GEORGE PEARSE FOADEN, Sparham House, Ashburton.                            |
| 1882. J. RODGER, Mertoun, St Boswells.                    | 1890. JAMES WEIR, Woodilee Farm, Lenzie  |
| 1883. ALEX. H. GIBSON, Kirkcaldy.                         | 1891. CHARLES ARNISON, Ravenstone, Wordsworth Street, Penrith.                   |
| 1883. ARTHUR HERBERT KERR, Crookham, Farnham.             |  |
| 1883. *PATRICK L. MAITLAND, Perry-mead House, Bath.       |  |
| 1883. HENRY B. MAYNE, Brantridge, Balcomb, Sussex.        |  |
| 1883. ROBERT ROUSE PETER, Buenos Ayres, South America.    |  |
| 1884. *W. A. SANDERS, Sanders Park, Co. Cork.             |  |

\* Those marked with an asterisk \* are Members of the Royal Agricultural College, Cirencester.

- |  |   |
|--|---|
| 1891. R. G. CRASKE, 2 Beverley Road, Colchester.     | 1891. JAMES MACKINNELL, Kilmartin, Lochgilphead.              |
| 1891. JAMES S. GORDON, Stragollen House, Strablane.  | 1891. W. G. MASON, Marsh Grange, Kirby-in-Furness, Carnforth. |
| 1891. R. B. GREIG, Balcurvie, Windygates, Fife.      | 1891. L. C. SEHEULT, Arima, Trinidad, British West Indies.    |
| 1891. WILLIAM HUTCHISON, 10 Dudgehope Place, Dundee. | 1891. M. H. WARD, Fernside, St Helens.                        |
| 1891. GEORGE T. LUXTON, 136 London Road, Gloucester. | 1891. WILLIAM WILSON, Goody Hills, Maryport.                  |

## SYLLABUS OF EXAMINATION

### FOR CERTIFICATES AND DIPLOMA.

#### I.—SCIENCE AND PRACTICE OF AGRICULTURE.

1. Geological strata—surface geology—formation of soils—their classification—chemical and physical characters and composition—suitability for cultivation. 2. The principle of rotations—rotations suitable for different soils—systems of farming. 3. The composition of (a) manures—general and special—amounts used per acre—period and mode of application. The composition of (b) feeding substances—their suitability for different classes of farm stock—considerations affecting their use. 4. "How crops grow"—our farm crops—their cultivation—diseases—insect injuries and remedies—their chemical composition. The formation and management of plantations. 5. The principles on which drainage, irrigation, and warping operations should be based and carried out. The application of lime—marl—clay, &c. 6. Meteorology, or the laws of climate as affecting plant-life—the influence of light and heat on cultivation—of absorption and retention of heat and moisture—of porosity and capillarity in soils. 7. The breeding, rearing, feeding, and general treatment of farm stock—the different breeds of horses, cattle, sheep, and pigs—their characteristics—the districts where they are generally met with. 8. The machines and implements used in farming—their uses, prices, and the principal points to be attended to in their construction. 9. The "prime movers," or sources of power used in agriculture: man—horse—wind—water—steam—their relative values and advantages. *Text-books*—Morton's 'Cyclopedia of Agriculture,' Blackie & Son; Wallace's 'Farm Live Stock,' Oliver & Boyd; Harris's 'Cheese and Butter Maker's Handbook,' Dunn & Wright; M'Connell's 'Agricultural Note-Book,' Crosby Lockwood & Son; 'Our Farm Crops,' Blackie & Son; 'How Crops Grow,' Macmillan & Co.; Warrington's 'Chemistry of the Farm,' Bradbury, Agnew, & Co.; M'Alpine's 'Grasses'; Geikie's 'Outlines of Geology.'

#### II.—BOTANY.

1. Nutritive Organs of Plants.—Root, stem, leaves. Functions of roots. Various kinds of stem, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves. 2. Reproductive Organs.—Flower and its parts. Arrangements of the whorls of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plant or embryo. Sprouting of the seed, or germination. 3. General Principles of Classi-

fication.—Meaning of the terms Class, Order, Genus, and Species. Illustrations of natural orders taken from plants used in agriculture, such as grain-crops, grasses, clovers, vetches, turnips, mangel-wurzel, peas, beans, &c. Practical examination in fresh specimens and models; some of the latter may be seen in the Museum, at the Royal Botanic Garden, which is open daily to the public, free. *Text-book*—Balfour's 'Elements of Botany,' A. & C. Black, 1876, price 3s. 6d.

### III.—CHEMISTRY.

The general principles of chemical combination. The chemistry of the more commonly occurring elements, and their more important compounds. The chemical processes concerned in agriculture generally. The changes which take place in the germination, growth, and maturation of plants, in the weathering and manuring of soils, &c. The composition and chemical character of the common mineral manures. *Text-books*—Roscoe's 'Lessons in Elementary Chemistry,' Macmillan & Co., London, price 4s. 6d.; Johnston and Cameron's 'Elements of Agricultural Chemistry and Geology'; Johnston's 'How Crops Grow,' Macmillan & Co., London; Warington's 'Chemistry of the Farm,' Bradbury, Agnew, & Co., London.

### IV.—NATURAL HISTORY.

#### 1. ZOOLOGY.

1. The characters distinguishing the primary divisions of the Animal Kingdom. 2. The Orders of the Class Insecta. 3. The principal insects injurious to crops. 4. The animal parasites, external and internal, affecting domestic animals; their life-histories and position in the zoological scale. 5. The Chordate or Vertebrate Type, with its subdivisions. 6. The Orders of Mammalia, with special reference to the domestic and wild mammalia of Great Britain. *Text-book*—Nicholson's 'Introductory Text-Book of Zoology,' William Blackwood & Sons, Edinburgh and London.

#### 2. GEOLOGY.

7. The various strata forming the earth's crust in their order of deposition. 8. Their influence on the surface-soils of the country. 9. The meaning and application of Disintegration, Drift, Alluvium, Dip, Strike, Fault. *Text-books*—Page's 'Introductory Text-Book of Geology' and Lyell's 'Students' Elements of Geology.'

### V.—VETERINARY SCIENCE.

1. Anatomy of the digestive organs of horse and ox, describing their structural differences. 2. The process of digestion in the above animals, and food most proper for each in quantity and quality. 3. The management of stock before, at, and after parturition. The time of utero-gestation in the domesticated animals. 4. The general principles to be followed in the treatment of acute and common diseases before assistance of the veterinary surgeon can be procured. *Text-books*—'Youatt on Sheep,' price 7s. 6d.; Steel's 'Diseases of the Ox,' price 15s.; Williams's 'Principles and Practice of Veterinary Surgery,' price 30s.; Williams's 'Principles and Practice of Veterinary Medicine,' price 30s., MacLachlan & Stewart, Edinburgh.

## VI.—FIELD-ENGINEERING.

1. Land-surveying with the chain. 2. Mensuration of areas of land, in imperial and Scotch acres, from a chain survey or from a plan. 3. Levelling with the ordinary levelling instrument and staff, and calculating levels and gradients. *Text-book*—‘Rudimentary Treatise on Land and Engineering Surveying,’ by T. Baker, C.E., Weale’s Series, price 2s. Part i. chaps. 1, 2, 3, and 6, and part ii. chap. 1, to be read.

## VII.—BOOK-KEEPING.

1. Questions in Practice and Proportion. 2. Book-keeping—Describe books to be kept; give examples—taking of stock. *Text-book*—Stephens’ ‘Practical System of Farm Book-keeping,’ William Blackwood & Sons, Edinburgh, price 2s. 6d.

## EXAMINATION PAPERS, 1892.

## AGRICULTURE.

1. Given a farm of 500 acres of arable land of good quality, 100 of which are in permanent pasture (a dairy of 50 cows and a mixed stock of feeding cattle and sheep being kept to consume the bulky produce), detail the method of working you would adopt; show what amount of stock you would be able to keep by estimating the amount of food consumed, both home-grown and purchased food. Fix a rent per acre to indicate the quality of the land under consideration, and show in detail how you arrive at your conclusions.

2. Describe in detail a good method of feeding a farm-horse, and make a calculation of the cost for a year.

3. Give a list of the root crops commonly grown in Britain. Describe how you would clean and prepare a foul field for a turnip crop. State the kinds and quantities of manures you would apply (a) with farmyard manure, and (b) with artificial manure alone.

4. What are the advantages of a rotation of crops? Give suitable rotations (a) for light land, (b) for rich loam, and (c) for stiff clay, and show why the rotation (a) is not suitable for (b) and (c). Point out the advantages and defects of the Norfolk four-course rotation.

5. Describe the management and cost of keeping a dairy cow for a year, giving approximate average quantities of milk, butter, and cheese which an Ayrshire cow should yield in that time. State how you would dispose of produce in different circumstances, and what prices you would expect for it.

6. State suitable quantities of seed per acre for crops of wheat, barley, oats, mangel, turnips, and potatoes, and give a suitable list of seeds for permanent pasture and for two-years’ grass.

7. Take a farm of 300 acres. How many horses would it require to work it, say on a four-course shift? How much would you expect a man and a pair of horses to plough in a full day of stubble land? Would he do more or less on lea land? and how many acres would a man harrow in a day with a pair of horses?

8. Take a farm with 150 acres of corn to cut at harvest, and you had two reapers to do it with, how many hands would you require to keep them going, and how many acres would you expect to cut in a day?

*(Three hours allowed.)*

## BOTANY.

1. Explain why certain soil conditions are favourable and others unfavourable to root growth and development.

2. What parts of agricultural plants may be sown or used for the production of a crop? Give examples.

3. Describe the accompanying specimen, beginning from the root upwards.

4. Name two useful plants and two troublesome weeds belonging to the orders Compositæ and Cruciferae.

5. Do you know any plants which bind shifting sands on the sea-shore? Enumerate them, and explain the action.

*(One and a half hour allowed.)*

## CHEMISTRY.

1. How is ammonia prepared? What are its properties? How may its composition be determined?

2. To what chemical and physical properties do the following substances owe their value as disinfectants, and what changes do they undergo in the process of disinfection?—Sulphurous acid; permanganate of potash; chloride of lime; carbolic acid.

3. What is the composition of urea? To what class of bodies does it belong? To what kind of decomposition is it liable in urine? How may it be extracted from urine? How may it be prepared artificially?

4. What is the average composition of cow's milk? How may each of the constituents be obtained from it separately?

*(One and a half hour allowed.)*

## NATURAL HISTORY.

### ZOOLOGY.

1. Give an account of the life-history of, damage done by, and remedies against, the turnip-fly (*Haltica nemorum*).

2. To what orders of insects do the following belong?—Bot-fly, cockchafer, turnip-sawfly, greenfly, corn-thrips, wireworm.

3. Contrast the skeleton of the fore limb in a horse, pig, and sheep. In what respects do the horns of deer differ from those of the ox?

4. What are the wild mammalia indigenous to Britain? and state the orders to which they belong.



## GEOLOGY.

1. Explain the term "pseudomorph," and illustrate by an example.
2. Explain the terms vein, seam, neck, dyke.
3. In what geological horizons in Great Britain do workable deposits of coal and iron-ore occur?
4. Briefly contrast the palæontology of the Carboniferous and Old Red Sandstone formations in Scotland.

*(One and a half hour allowed.)*

## VETERINARY SURGERY.

1. What is strangles in horses? Describe the progress of a typical case.
2. What is the nature of white scour in calves, the causes producing it, and the treatment?
3. Sketch a ground-plan for a stable for six cart-horses, with loose-box, giving dimensions of walls, stalls, doorway, and box. Mention necessary details as to foundations, drainage, lighting, ventilation, and the cubic space requisite for each horse.
4. Define the following terms: Contagion, heredity, exostosis, microbe, ulcer, anæmia, diuresis, tænia, tincture, sprain.

*(One and a half hour allowed.)*

## MENSURATION AND FIELD-ENGINEERING.

**NOTE.**—Candidates must work out the questions on sheets of paper which will be supplied to them, which sheets must be signed by the candidates, and lodged, along with this examination paper, with the Secretary. The answers to the questions, excepting Nos. 4 and 7, are also to be filled in on this paper.

## NOTE OF IMPERIAL MEASURE.

10,000 square links	=	1 square chain.		
625 do.	=	0·0625 do.	=	1 pole.
25,000 do.	=	2·5 do.	=	40 poles = 1 rood.
100,000 do.	=	10 do.	=	160 do. = 4 roods = 1 acre.

The imperial is to the Scotch acre as 1 : 1·261 nearly.

1. Calculate the area of the enclosure A in imperial acres, roods, and poles, and also in acres and decimals.
2. Calculate the area of the triangular enclosure A B C in imperial acres and decimals, and also calculate the length of the side A C.
3. Measure by the scale the enclosure C, mark the measurements necessary to calculate the area from, in links on the paper, and calculate from them the area in imperial acres and decimals.
4. In the figure D, HE is an irregular boundary; FG a straight station-line; FH and EG perpendiculars to FG. Measure by the scale, and mark in links on the paper, the measurements required in order to survey the boundary HE.

5. Calculate from these measurements the area of the piece of land FHEG, in imperial acres and decimals.

6. The contents of a piece of land being 450 Scotch acres, required the area in imperial acres and decimals.

7. Write down, as if in a level-book, the staff-readings in feet and decimals shown in sketch section; then reduce the levels beginning at H, so as to calculate the heights of K, L, and M above datum line,—all in feet and decimals.

8. Calculate the gradients of rates of inclination of the ground between the points H and K, K and L, and L and M.

$$\text{Answer } \begin{cases} \text{H and K} = \\ \text{K and L} = \\ \text{L and M} = \end{cases}$$

(One and a half hour allowed.)

### ARITHMETIC AND BOOK-KEEPING.

1. Find the value of 3221 qrs. of oats at £1, 2s. 2½d. per qr.

2. Buying 300 sheep at 30s. each and 250 at 19s. 6d. each, what is the gain or loss per cent by selling them at a uniform rate of 24s. 6d. each?

3. Add together £3½, ¼ crown, ⅔ guinea, and ⅞ shilling.

*Note.*—To be worked by fractions, and working shown.

4. If a penny loaf weighs 1½ lb. when wheat costs 63s. per qr., what will be the weight of the threepenny loaf when wheat costs 72s. per quarter?

5. Pigs weighing 3 tons 4 cwt. 84 lb. were purchased alive at 10s. 6d. per stone, and after allowing ¼th for waste, were retailed at 1s. 0½d. per lb. What was the profit or loss?

*Note.*—A stone of dead meat is 8 lb., of live meat 14 lb.

6. A strip of land 1 mile long by 8 feet 3 inches wide contains just an acre: required the length of land of the same area which shall be 16½ yards wide.

7. A young farmer having taken a farm, one-half arable and the other half in grass, received a loan of £3000 to stock and work the farm, on the stipulation that he presents a yearly Balance-Sheet and relative Profit and Loss Account. Name the books which he should keep to attain this end, and describe briefly their nature and the respective purposes for which they are required.

8. The farmer having been in business six months, has the following entries in his Memorandum-book—viz.:

*Nov.* 14. Let the grass park next the steading for wintering at £11 to James Speedy, less 5 per cent for cash forehand.

" 15. Received price of 6 fat cattle at £13, 10s. each, sold last market day by Fraser, less £4, 10s. 6d. his commission and charges.

" 16. Speedy paid me to-day, and I paid into my bank account, £85, 12s.

" 17. Went to the bank to-day, drew £70, and paid the half-yearly servants £60. Handed the housekeeper for household expenses £5.

" 18. Paid James Black his account for fencing, £5.

In terms of the lease, I fall to deduct this payment from next half-year's rent.

- Nov. 19. Bought £45 worth of oilcake for feeding purposes, and handed Cunningham & Co. a cheque in payment.
- " 24. Drew a cheque to-day for £19 in favour of Cross & Son, in payment of seeds which in the spring were supplied by them.
- " " Bought from John Wilson 10 stirks at £7 each, and granted him a bill at 3 months for the price.

Show these entries under their respective accounts in the books you have named.

*(One and a half hour allowed.)*

## BURSARIES.

### REGULATIONS FOR EXAMINATION OF CANDIDATES.

1. The examinations shall be conducted simultaneously about the middle of October at the place where the Show was last held in each Show district (in which there are candidates), on the plan followed in the examinations under the Science and Art Department.

2. A paper shall be set by one of her Majesty's inspectors, assistant inspectors of schools, or other person selected for the purpose—the subjects to be embraced being the ordinary branches of an English education.

3. One or more Directors (failing whom, some other member) of the Society in each district shall superintend the examination, which shall be wholly in writing. They shall require each candidate to make a written declaration that it is his intention to pursue Agriculture as a business. They shall open and distribute the papers in the presence of the candidates, and duly transmit their answers to the Secretary.

4. In reporting on the result, the examiner shall state the maximum number of marks in each subject, as well as the number gained by each candidate, with the view of the Board of Directors judging whether any candidate has shown a degree of merit entitling him to a bursary.

5. Candidates must be not less than fourteen years of age, and must be qualified by birth or residence in Scotland. The Council will consider each case on its own merits—their decision to be final.

6. In giving notice of intention to compete for a bursary, applicants must state at which of the following places they wish to be examined,—viz, Edinburgh, Aberdeen, Dumfries, Perth, Glasgow, Melrose, Stirling, Inverness.

Those wishing to compete for bursaries must apply for entry certificate to F. N. Menzies, 3 George IV. Bridge, Edinburgh.

### EXAMINATION PAPER.

*15th October 1891, from two to five o'clock.*

Candidates should first read the following regulations:—

- (1.) Three hours allowed for this paper.
- (2.) Candidates should answer questions in *each* of the three sections, but in Section I. they *must not attempt more than four* questions.

(3.) Marks will be given for handwriting.

(4.) It is strictly forbidden, under any pretext whatsoever, to use books or notes, or to address questions to any one.

### SECTION I.

1. A gentleman's net income after paying income-tax at 6d. per £1 was £731, 15s.; what would it be if the tax were 7½d. per £1?

2. Simplify  $\frac{3.5 \times .001 + 3.125}{2.75 \div .005}$ .

3. A gentleman's property was divided among his five children, the eldest getting  $\frac{1}{5}$ , and the second  $\frac{1}{3}$  of the remainder, while the three youngest had the rest divided equally among them: if each of these three received £150, what was the whole property worth?

4. Railway shares are paying a dividend of 7½ per cent, but £10 shares cost £25 each; what interest is received on money invested?

5. How much per cent is gained by selling oranges at 2 for 3d. which were bought at 3 for 4d.?

6. A horse, gig, and harness cost £180. The horse cost five times as much, and the gig three times as much as the harness; find the cost of each.

### SECTION II.

1. Write an essay on "Life in the Tropics," or on "Presence of Mind." (Not more than half an hour should be occupied with this exercise.)

2. Analyse the following passage into its grammatical clauses, and show their relations to one another:—

"If, as was most generally the case, they placed themselves under the protection of any of the petty kings in their vicinity, accepted of feudal offices in his household, or bound themselves by mutual treaties of alliance and protection to support him in his enterprises, they might indeed purchase temporary repose; but it must be with the sacrifice of that independence which was so dear to every English bosom."

3. Give lists of the words in the preceding passage which you know to be taken from (a) Latin and (b) French words. When and how were words from the French most largely introduced into English?

4. Correct the grammatical errors in the following sentences:—

"Between you and I, he is not near as good as he ought to be."

"Neither of the two were aware of their danger, being too intent on his own work."

"One can hardly keep their temper with those sort of people."

"A fort was built on both sides of the river, but that on the furthest side was much the weakest."

### SECTION III.

1. Describe shortly the physical features of (a) *India*, or (b) *Canada*. Account for the chief differences of climate in the different parts of the country described.

2. Give the *situation*, and a note regarding the *trade*, of each of the following places: Kiel, Kimberley, Cape Coast Castle, Port Said, Falmouth, Chicago.

3. Describe briefly, with date, the principal *historical event* connected with each of the following places: Hastings, Runnymede, Philadelphia, St Andrews, Plassey, Elba.

4. Explain shortly *one* of the following:—

- (a) The construction and action of a lightning-conductor.
- (b) The characteristics, preparation, and common compounds of chlorine.
- (c) The structure of flower and fruit in the common strawberry.
- (d) The spinal cord and its functions.

## VETERINARY DEPARTMENT.

The Society established a Veterinary Department in 1823, but by an arrangement made with the Royal College of Veterinary Surgeons, the Society's examination ceased in 1881. Holders of the Society's Veterinary Certificate are entitled to become Members of the Royal College of Veterinary Surgeons on payment of certain fees, without being required to undergo any further examination. The number of Students who have passed for the Society's Certificate is 1183.

In 1874, the Society resolved to vote annually eight silver medals for Class Competition to each of the two Veterinary Colleges in Edinburgh, and to the one in Glasgow.

## FORESTRY DEPARTMENT.

The Society grants FIRST and SECOND CLASS CERTIFICATES in FORESTRY.

### BOARD OF EXAMINERS.

1. *Science of Forestry and Practical Management of Woods*.—COLONEL BAILEY, Lecturer on Forestry, Edinburgh University; Dr SOMERVILLE, Durham College of Science, Newcastle-on-Tyne; LEWIS BAYNE, Forester, Jeanie Bank, Old Scone, Perth; JAMES KAY, Forester, Bute Estate, Barone Cottage, Rothesay; J. GRANT THOMSON, Grantown, Strathspey.
2. *Elements of Botany*.—Dr CLEGHORN and Professor BAYLEY BALFOUR.
3. *Elements of Chemistry*.—Dr WM. CRAIG and Dr A. P. AITKEN, Edinburgh.
4. *Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to Fencing, Drainage, Bridging, and Road-making*.—A. W. BELFRAGE, C.E., Edinburgh.
5. *Book-keeping and Accounts*.—WM. HOME COOK, C.A., Edinburgh.

Candidates must possess—1. A thorough acquaintance with the theory and practice of Forestry. 2. A general knowledge of the following branches of study, so far as these apply to Forestry: The Elements of Botany; Elementary Chemistry, especially as applied to Atmosphere,

Water, Soil, and Vegetation; Land and Timber Measuring and Surveying; Mechanics and Construction, as applied to fencing, draining, bridging, and road-making; Implements of Forestry; Book-keeping and Accounts. The examinations are open to candidates of any age.

The following have obtained First-Class Certificates:—

GEORGE YOUNG WALL, M.R.A.C., Durham,	1870
WILLIAM BAILLIE, Forester, Whittinghame, East Lothian,	1871
WILLIAM ROBERTSON, Forester's House, Lauder,	1871
PETER LONEY, Marchmont, Duns,	1873
JOHN M. AITKEN, Norwood, Lockerbie,	1880
RICHARD HENDERSON, Portland Estates Office, Kilmarnock,	1880
A. H. GIBSON, Kirkcaldy,	1882
ALEX. INGLIS, Tynninghame, Prestonkirk,	1882
PETER REID, Port Ellen, Islay,	1884
JOHN HARDIE WILSON, D.Sc., F.R.S.E., Royal Botanic Garden, Edinburgh,	1884
CECIL HENRY HOOPER, M.R.A.C., Painshill, Cobham, Surrey,	1886
WILLIAM SOMERVILLE, Lecturer on Forestry, Edinburgh University,	1886
JOHN BARDGETT, Sockbridge Mill, Tirril, Penrith,	1887
WILFRED JAMES FLEET, Marchmont, Duns,	1888
ARTHUR CHARLES FORBES, Knowefield, Carlisle,	1888
A. J. FARQUHARSON, Newtyle, Forfarshire,	1890
JOHN C. MENZIES, Bankhead, Duns,	1891

The following have obtained Second-Class Certificates:—

JOHN M'EWEN, Yellow Cottage, Killin,	1880
THOMAS BERWICK, 56 North Street, St Andrews,	1885
DONALD C. CAMERON GRANT, Southleigh, Murrayfield,	1886
JOHN A. SAWYER, Horningsham, Warminster, Wilts,	1891

## SYLLABUS OF EXAMINATION.

### I.—SCIENCE OF FORESTRY AND PRACTICAL MANAGEMENT OF WOODS.

1. Structure, formation, and ripening of Wood. Predisposing causes of decay. 2. Restoration of Wood-lands:—(1) Natural reproduction; (2) Artificial planting. 3. General management of plantations. Cropping by rotation. Trees recommended for different situations. 4. Season and methods of pruning, thinning, and felling. 5. Circumstances unfavourable to the growth of trees. 6. Mechanical appliances for conveying and converting timber. The different implements and tools used in planting, pruning, felling, barking, and working up timber-trees, or preparing them for sale. Construction of saw-mills. 7. Qualities and uses of chief indigenous timbers. 8. Management of nurseries. Seed-sowing. 9. Collection of forest produce. 10. Mammals, birds, and insects which are destructive to trees.

*Books recommended.*—‘Theory and Practice of Horticulture,’ Lindley; ‘Arboriculture,’ Grigor, 10s. 6d.; ‘Silviculture,’ Bagnieris, 5s.; ‘Coniferæ,’ Veitch; ‘Injurious Insects,’ Ormerod, 3s.

*Candidates are also obliged to undergo a Practical Examination in Forestry.*

## II.—ELEMENTS OF BOTANY.

1. Nutritive Organs of Plants.—Root, stem, leaves. Functions of roots. Various kinds of stems, with examples. Use of the stem. Structure of leaves. Different kinds of leaves. Arrangement and functions of leaves. 2. Reproductive Organs.—Flower and its parts. Arrangement of the whorls of the flower—calyx, corolla, stamens, pistil. Ovule. Mature pistil or fruit. Pruning and grafting. Seed. Young plant or embryo. Sprouting of the seed or germination. 3. General Principles of Classification.—Meaning of the terms Class, Order, Genus, Species. Illustrations taken from common forest trees and shrubs. Practical examination on fresh specimens and models. These may be seen in the Museum at the Royal Botanic Garden, which is open to the public. Candidates may consult Professor Balfour's 'Elements of Botany,' A. & C. Black, Edinburgh, 3s. 6d.; Oliver's 'Elementary Lessons in Botany,' London, 4s. 6d.

## III.—CHEMISTRY.

Candidates are required to have an elementary knowledge of Chemistry, such as to enable them to classify the most commonly occurring elements and their most familiar compounds, and to describe their chief characters.

They will be examined more particularly on the following subjects:—

*Atmosphere.*—Its composition and physical properties,—the causes of changes in its temperature and pressure, and the measurement of these changes by means of the thermometer and barometer. The formation of rain and dew. Gases injurious to vegetation.

*Water.*—The effects of heat upon it; its movements, its solvent properties, the methods of regulating the supply of water by drainage and irrigation. The characteristics of rain-water, spring-water, and surface-water. The relations of water to the growth and health of plants, and to the climatic conditions of a district.

*Soil.*—The description and classification of soils, and their suitability to the growth of different descriptions of timber-trees. The composition of soils, with special reference to the constituents on which their fertility depends, or which are the cause of their sterility. The changes produced in the composition of soils by various physical operations, such as drainage, irrigation, mulching, removal of leaves, &c., and by liming, salting, and manuring.

*Vegetation.*—The influence of temperature, rainfall, altitude, aspect, and shelter upon the growth of trees. The conditions favourable to germination. The effects of light, heat, and ventilation upon the growth of trees.

*Forest Products.*—The preparation and chemical characters of charcoal, potashes, tar, and turpentine.

*Preservation of Timber.*—Creosoting, kyanising, &c.

*Books recommended.*—'First Principles of Agriculture,' Tanner (Macmillan & Co.); 'Physics Primer,' Balfour Stewart; 'Inorganic Chemistry,' by George Wilson (Chambers).

IV.—LAND AND TIMBER, MEASURING AND SURVEYING;  
MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING,  
BRIDGING, AND ROAD-MAKING.

1. The use of the level and measuring-chain. Measuring and mapping surface areas. 2. The measurement of solid bodies—as timber, stacked bark, fagots, &c., earthwork. 3. The different modes of fencing and enclosing plantations; their relative advantages, durability, cost of construction, and

repairs. 4. The setting out and formation of roads for temporary or permanent use. 5. The construction of bridges over streams and gullies; of gates or other entrances. Strachan's 'Agricultural Tables,' Oliver & Boyd, Edinburgh, price 2s. 6d.; or Horton's Tables.

### V.—BOOK-KEEPING AND ACCOUNTS.

1. Questions in Practice and Proportion. 2. Book-keeping—describe books to be kept; give examples. Taking of stock.

## EXAMINATION PAPERS, 1892.

### PRACTICAL FORESTRY.

1. *Nurseries*.—State what you know about raising young trees in nurseries. Compare the qualities of seedlings and transplants.

2. *Planting*.—(a) Describe the system of planting with balls of earth, and state when this system should be employed. (b) The system of planting you would adopt in forming extensive plantations.

3. *Pruning*.—(a) Explain what is meant by "natural pruning." What are the main characteristics of trees which, in crowded woods, become naturally pruned the quickest? (b) What are the principal objects of artificial pruning? To what dangers does the pruning of green branches expose the tree? How is the pruning carried out when the object is to produce valuable timber? Describe the healing of the wound.

4. *Reproduction by stool and root shoots*.—What species of trees give the best results? How is the cutting effected? What is the best season for cutting, and why is it the best? and the influence of standards on coppice?

5. *Damage by insects*.—State what you know about the principal kinds of insects which are injurious to trees. What is the nature of the damage they do? and what precautions can be taken against them?

(Two hours allowed.)

### BOTANY.

1. Describe the process of respiration in plants. Of what use is the process to the plant?

2. If a large branch of a tree is lopped off, the wound thus caused is gradually healed over. How is this accomplished?

3. Give some account of the characteristic structural features of the British trees belonging to the order of Cupuliferae.

4. What are the conditions requisite for proper germination of a seed? Supposing those present, describe the changes that take place in the seed during germination.

(One and a half hour allowed.)



## CHEMISTRY.

1. Explain the method of converting limestone into caustic lime.
2. What is the use of sand in the making of mortar, and what are the changes which take place in the setting of mortar?
3. What are the chief substances found in, or formed in, the soil that are injurious to the roots of plants? In what situations or in what circumstances are they produced?
4. What are the conditions favourable to the germination of seed, and what are the processes going on in the germinating seed that require these conditions?

*(One and a half hour allowed.)*

LAND AND TIMBER MEASURING AND SURVEYING;  
MECHANICS AND CONSTRUCTION AS APPLIED TO FENCING  
DRAINAGE, BRIDGING, AND ROAD-MAKING.

1. What is required so as to be certain of the correct adjustment of a spirit-level for accurate sights?
2. Make form of level-book on separate paper, with four sights marked with imaginary lengths and remarks.
3. Make sketch section of same to imaginary scale, marking on total heights from datum with the imaginary lengths from starting-point.
4. Describe the different kinds of fences, and where suitable, keeping expense in view.
5. Draw sketch of best construction for wooden gate.
6. Draw sketch of wooden bridge of 30 feet span over ravine above burn.
7. Describe method of road-making of permanent character of 30 feet width.

*(Two hours allowed.)*

## ARITHMETIC AND BOOK-KEEPING.

1. I sold a plantation which cost me £250, 10s., at a profit of 15 per cent: what did I receive for it?
2. (a) What is the price of 207 acres 15 perches of land at £26, 17s. 6d. per acre? (b) If 15 men build 37 roods of a wall in 27 days, how many roods, &c., will 74 men build in 63 days?

*Note.*—36 square yards are a rood of building.

3. A grazier left to his 5 children in equal portions 175 oxen, 2003 sheep, 563 pigs, and 87 fowls: what was the value of each of their fortunes, supposing the oxen to be worth 11 guineas each, the sheep a guinea and a half each, the pigs half a guinea each, and the fowls 9d. each?
4. Reduce 8 miles 7 furlongs 9 poles to the decimal of 40 miles 7 furlongs 24 poles.
5. Find the cubic content of a log of wood 20 feet long, 1 foot 6 inches broad, and 2 feet 4 inches thick.
6. Find the value of 14 cwt. 2 qrs. 14 lb. at £4, 18s. 4d. per cwt.
7. Describe briefly the books a forester ought to keep, and their nature and use.

*(One and a half hour allowed.)*

## CHEMICAL DEPARTMENT.

*Chemist to the Society*—Dr A. P. AITKEN, Chemical Laboratory,  
8 Clyde Street, Edinburgh.

The object of the Chemical Department is to promote the diffusion of a knowledge of Chemistry as applied to agriculture among the members of the Society, to carry out experiments for that purpose, to assist members who are engaged in making local experiments requiring the direction or services of a chemist, to direct members in regard to the use of manures and feeding stuffs, to assist them to put the purchase of these substances under proper control, and in general to consider all matters coming under the Society's notice in connection with the Chemistry of Agriculture.

## MEMBERS' PRIVILEGES IN RESPECT OF ANALYSES.

The fees of the Chemist for analyses made for members of the Society shall be as follows :—

The estimation of *one* ingredient in a manure or feeding stuff, . . . 5s.

The estimation of *two* or *more* ingredients in . . . do. . . 10s.

*These charges apply only to analyses made for agricultural purposes, and for the sole and private use of members of the Highland and Agricultural Society who are not engaged in the manufacture or sale of the substances analysed.*

If the sample represents a substance bought under a guarantee, and if it is found to be notably deficient, the Chemical Committee shall take cognisance of such deficiency in the same manner as they do in the case of deficient manures and feeding stuffs supplied to members of analytical associations (see page 30), provided that the Society's regulations as regards sampling are carried out, and that the seller's guarantee accompanies the sample.

Also, that valuations of manures, according to the Society's scale of units (see page 40), shall be supplied in all cases in which the cash price asked by the seller accompanies the sample.

The following analyses are made for *five shillings* :—

*Simple Nitrogenous Manures*—viz., nitrate of soda, sulphate of ammonia, horn-dust, dried blood, meat-meal, shoddy, soot, &c.

*Simple Phosphatic Manures*—viz., mineral phosphates, phosphatic guano, basic slag, &c., superphosphate (soluble phosphate only).

*Simple Potassic Manures*—viz., sulphate of potash, muriate of potash, potashes, &c.

The following analyses are made for *ten shillings* :—

*Manures*—viz., all compound and mixed manures, e.g., bone-meal, dissolved bones, guanos, &c.

*Feeding Stuff*s—viz., oilcakes, meals, and compounds.

## MISCELLANEOUS.

Analysis of water <sup>1</sup> to determine purity, hardness, and fitness  
for domestic use . . . . . £1 0 0

Analysis of agricultural products—hay, grain, ensilage, roots,  
&c. . . . . 1 0 0

Analysis of soil, to determine fertility and recommendation  
of manurial treatment . . . . . 2 0 0

<sup>1</sup> Bottles for water samples are sent from the laboratory on application.

Examination of food or viscera for metallic poison	£2	0	0
Examination of food or viscera for alkaloid poison . . . . .	2	0	0

Samples should be sent (carriage paid) to Dr A. P. Aitken, 8 Clyde Street, Edinburgh.

## INSTRUCTIONS FOR SELECTING SAMPLES FOR ANALYSIS.

### MANURES.

Four or more bags should be selected for sampling. Each bag is to be emptied out separately on a clean floor, worked through with the spade, and one spadeful taken out and set aside. The four or more spadefuls thus set aside are to be mixed together until a uniform mixture is obtained. Of this mixture one spadeful is to be taken, spread on paper, and still more thoroughly mixed, any lumps which it may contain being broken down with the hand. Of this mixture two samples of about half a pound each should be taken by the purchaser or his agent, in the presence of the seller or his agent or two witnesses (due notice having been given to the seller of the time and place of sampling), and these samples should be taken as quickly as possible, and put into bottles or tin cases to prevent loss of moisture, and having been labelled, should be sealed by the samplers—one or more samples to be retained by the purchaser, and one to be sent to the chemist for analysis.

### FEEDING STUFFS.

Samples of feeding compounds should be taken in a similar manner.

Samples of cake should be taken by selecting three cakes, breaking each across the middle, and from the broken part breaking off a segment across the entire breadth of the cake. The three segments thus obtained should be wrapped up and sealed by the samplers, and sent for analysis as in the case of manures, and three duplicate segments similarly sealed and labelled should be retained by the purchaser.

### SOILS.

Dig a little trench about two feet deep, exposing the soil and subsoil. Cut from the side of this trench horizontal scrapings of the soil down to the top of the subsoil. Catch these on a clean board, and collect in this manner about one pound weight of soil taken from the whole surface of the section. Similar scrapings of subsoil immediately below should be taken and preserved separately. Five or six similarly drawn samples should be taken from different parts of the field, and kept separate while being sent to the chemist, that he may examine them individually before mixing in the laboratory.

### VEGETABLE PRODUCTS.

*Turnips, &c.*, 20 to 30 carefully selected as fair average bulbs.

*Hay, straw, ensilage, &c.*, should be sampled from a thin section cut across the whole stack or silo, and carefully mixed about; about 2 lb. weight is required for analysis.

*Grain* should be sampled like manures.

### DAIRY PRODUCE.

*Milk*.—Samples of milk from individual cows should be taken direct from the milk-pail. Average samples from a number of cows should be taken immediately after milking. Samples to be tested for adulteration should not be drawn from the bottom or taken from the top of standing milk, but they should be ladled from the vessel after the milk has been thoroughly mixed.

For most purposes a quart-bottle of milk is a large enough sample.  
*Butter and Cheese.*—About quarter-pound samples are required.

#### WATERS.

Samples of water for analysis should not be put into ordinary wine bottles or stoneware jars stopped with corks, as these usually vitiate the samples. Clear glass Winchester quarts with glass stoppers should be used. Cases containing these, chemically cleaned, are forwarded from the laboratory on application.

Well-water should be allowed to run for some time before the sample is drawn.

Standing water from cisterns, tanks, ponds, &c., should be sampled by immersing the bottle entirely under the water, and holding it, neck upwards, about four inches below the surface.

Spring or stream water should be sampled in dry weather, by immersion, if possible; but if not deep enough for that purpose, a perfectly clean cup or glass should be used for transferring the water to the bottle.

When the bottle has been filled the stopper should be rinsed in the water before replacing.

Samples should be despatched to the laboratory *immediately* after being taken.

#### LOCAL ANALYTICAL ASSOCIATIONS.

I. With the view of encouraging, as well as regulating the conduct of, Local Analytical Associations, the Society contributes from its funds towards their expenses a sum not exceeding £250 annually.

II. The amount of such contribution is to each association at the rate of 10s. for each full analysis, and 5s. for each partial analysis<sup>1</sup> of manure or feeding stuff affected, or such proportion thereof as the above annual contribution may permit of. The pecuniary assistance thus offered is subject to the following conditions being complied with to the satisfaction of the Chemical Committee:—

1. That the rules of the association are submitted to and approved of by the Chemical Committee.

2. That it is a condition of participating in the grant that the association make analyses for members of the Highland and Agricultural Society, being farmers and not members of the local association, charging them the cost price to the association, less the amount recovered from the Society.

3. That the association is managed by a committee of practical farmers owning or occupying land in the district.

4. That the analyst employed is of acknowledged standing.

5. That the benefits of the grant apply only to analyses made for farmers, and that these subscribe towards the expenses of the association, subject to the exception in No. 2.

6. That each analysis represents at least one ton of bulk actually purchased and delivered to one or more members under guarantee, or at a specified price per unit of valuable ingredients.

7. That the analysis has been made from a sample drawn after delivery, in accordance with the published instructions of the Society, and that a sealed duplicate sample has been retained.

8. That all analyses are reported according to forms furnished by the Highland and Agricultural Society, and that valuations of manures, if any are made, are calculated on a uniform standard to be issued periodically by the Society, and at least once a-year.

<sup>1</sup> A partial analysis is one in which only one important constituent has been determined by the chemist or guaranteed by the seller.

III. (a) A general report regarding the analyses for which the Society has contributed payment is submitted to the general meeting in January, and full details concerning manures and feeding stuffs whose analyses show any of the valuable constituents to be deficient to the extent of one-tenth of the amount guaranteed, or whose total deficiencies represent as much as one-tenth of the value of the manure or feeding stuff, are published in the 'Transactions.'

(b) In the case of every analysis showing the deficiency above described, the secretary of the association must obtain confirmation of the deficiency from the chemist. The deficiency having been confirmed, the duplicate sample must be forwarded to the Secretary of the Highland and Agricultural Society. A copy of the analysis must at once be sent to the seller, and any explanations received from him forwarded in due course to the Secretary of the Highland and Agricultural Society.

(c) Should the seller be dissatisfied with the results obtained by the analyst of the association, a further analysis may, at his option, be made from the duplicate sample by another analyst to be chosen by the Society, and at its cost if the further analysis exonerates the seller; if otherwise, at the seller's cost.

IV. The report of each analysis for which a grant is claimed must be sent to the Secretary of the Highland and Agricultural Society on or before the 1st November of each year, written on a schedule issued by the Society, and accompanied by a form of guarantee (also issued by the Society), which must be filled up and signed by the seller.

The schedules and guarantee forms are supplied by the Secretary of the Society on application, and no grant is given for any analysis whose schedule and guarantee form are not accurately filled up.

No grants will be given for analyses whose schedules are sent in later than 1st November.

The actual analytical reports of the association's analyst need not accompany the schedules, but must be forwarded if desired.

#### METHOD OF PROCEDURE TO BE FOLLOWED BY SECRETARIES AND MEMBERS OF ANALYTICAL ASSOCIATIONS APPLYING FOR GRANTS FROM THE HIGHLAND AND AGRICULTURAL SOCIETY.

1. When a member makes a purchase he must obtain from the seller an analytical guarantee, written and signed by the seller, upon a form supplied by the Society.

2. When the member receives delivery of the stuff bought, he must inform the seller of the time and place at which the samples are to be taken for analysis, so that he may have an opportunity of being present.

3. In sampling a manure or feeding stuff the Society's printed instructions for sampling must be strictly complied with.

4. The sample (if it is to be analysed) must be sent to the chemist within a week of the date of sampling, so that any deficiency may be immediately detected.

5. The chemist must be asked to send in his report of analysis within a fortnight after receiving the sample.

6. When an analysis shows the sample to be deficient to such an extent as to require investigation by the Society, the association's chemist must be asked to verify the accuracy of his analysis, and report the matter within a week.

7. When a deficiency has been confirmed the secretary of the association must immediately inform the seller thereof, and draw his attention to the provisions of Regulation III.

8. At the same time the duplicate sample must be sent to the Secretary

of the Highland and Agricultural Society, and along with it must be sent the schedule relating to the purchase, and also the guarantee form, both accurately filled up in every particular.

9. Any correspondence that may ensue with the seller or buyer must be forwarded to the Secretary of the Highland Society as soon as received, so that the Committee may be able to investigate the matter with full knowledge of all the details.

10. The schedules (accurately filled up) of all samples for which the association claims a grant, along with the signed guarantees appertaining to them, must be sent to the Secretary of the Highland and Agricultural Society on or before 1st November, or they will not be received.

## MANURES—THEIR COMPOSITION AND CHARACTERISTICS.

**Nitrate of Soda.**—A most valuable nitrogenous manure. Perfectly soluble, and immediately available for the nourishment of the plant. Feebly retained by the soil. Rapidly goes down to the subsoil. Benefits deeply-rooting plants. *When much nitrate of soda is frequently applied and unaccompanied by other manures, the soil becomes rapidly exhausted.*

Good samples contain 95 per cent or upwards of pure nitrate of soda, equivalent to about 19 per cent of ammonia.

**Sulphate of Ammonia.**—A more concentrated nitrogenous manure than the preceding. Perfectly soluble, but not so rapid in its action as nitrate of soda. It is somewhat firmly retained by the soil, and not so liable as nitrate of soda to be washed out by heavy rains. It is therefore more suitable than nitrate for wet districts.

Good samples contain 95 per cent or more of pure sulphate of ammonia, equivalent to from about 24½ to 25 per cent of ammonia.

**Dried Blood.**—A nitrogenous manure, which differs from the above in being insoluble. It must be decomposed in the soil before it yields up its nitrogen to the plant, and this it does only slowly. The nitrogen is in the form of albumen, and is capable of yielding from 12 to 16 per cent of ammonia.

**Horn-dust—Keronikon.**—An insoluble nitrogenous manure, capable of yielding 15 to 17 per cent of ammonia. Slower than dried blood. Its efficacy as a manure increases the more finely it is ground.

Horn, when in the form of chips or coarse shavings, decomposes extremely slowly, and is not suitable for application as a manure.

**Shoddy or Wool-waste.**—An insoluble nitrogenous material used by manure manufacturers as a source of ammonia in dissolved manures. It is capable of yielding from 5 to 14 per cent of ammonia. It is a useful manure when dissolved, but not otherwise.

**Leather.**—A very insoluble nitrogenous material, yielding about 9 per cent of ammonia, used by manure manufacturers after being melted and ground, but of little value until it has been dissolved.

**Peruvian Guano.**—A general manure formed of the excrements of fish-eating birds, and containing nitrogenous compounds, phosphates, and potash.

*High-class Peruvian guano* is rich in nitrogenous matter, a large proportion of which is soluble. As formerly imported, it was capable of yielding from 8 to 12 per cent ammonia, part of which was derived from ammonia salts, and part (less than 1 per cent) from nitrates. Phosphates were low, seldom exceeding 30 per cent, but from one-quarter to one-half of the phosphates were soluble. The amount of potash was usually from 3 to 5 per cent. Not now imported.

*Low-class Peruvian guano*, as now imported, is poor in nitrogenous

matter, yielding only from 3 to 5 per cent ammonia. The phosphates are correspondingly high—viz., from 30 to 50 per cent—but the proportion of soluble phosphate is much smaller than in high-class Peruvian guano. Potash occurs to a very small extent, viz., about 1 to 3 per cent.

Low-class guanos are formed originally from high-class guanos, by the washing out of soluble constituents by rain, &c., and their composition varies greatly according to the amount of washing they have undergone.

Genuine Peruvian guano frequently contains a large proportion of stony insoluble matter. It ought to be riddled before purchasing.

**Fortified Peruvian Guano.**—also called by various names, such as *improved, equalised, &c.*—Such guanos are mixtures, with low-class Peruvian guano for a basis. Sulphate of ammonia is added, and perhaps also other nitrogenous matter, to bring them up to the guaranteed analysis, say from 8 to 10 per cent ammonia.

**Dissolved Peruvian Guano.**—This is usually Peruvian guano dissolved in sulphuric acid, and fortified with sulphate of ammonia so as to make a strong, active manure.

**Ichaboe Guano.**—A true guano, but of recent formation. It is very rich in nitrogenous matter, which yields from 10 to 16 per cent of ammonia, but a large part of the nitrogenous matter is in the form of feathers, which are insoluble and of low manurial value, otherwise it resembles high-class Peruvian guano. The total phosphates vary from 18 to 30 per cent, of which from a fourth to a half is usually soluble. There is seldom as much as 2 per cent potash present.

**Fish Guano.**—Derived from fish-curing yards, and consisting of the heads and offal of fish, dried and ground. Properly speaking, it is not a guano. The name guano is properly applied only to the dung of birds and some other animals.

*High-class fish guano* contains nitrogenous matter, yielding from 10 to 12 per cent of ammonia, but it is in the form of insoluble albuminous compounds, which only slowly decompose and become available as plant-food. The phosphates range from 18 to 30 per cent, and are all insoluble.

*Low-class fish guanos* are substances like the preceding, but containing less nitrogenous matter and more phosphates. They are simply fish-bone manures, with somewhat more ammonia and less phosphate than ordinary bone-meal, and having no real resemblance to a guano.

Fish guanos are usually impregnated with fish-oil, which detracts from the value of the manure. The oil should not exceed 3 per cent.

**Frey-Bentos Guano.**—The dried and ground residue and *debris* of animals after the extraction of "*Liebig's Extract*." It is not a guano. There are various grades of this manure. One contains much bone matter, another a good deal of horn. They are slow manures. The best manure is derived from muscular fibre, yielding about 14 per cent ammonia and about 5 per cent phosphate. It is a strong nitrogenous manure, variously named.

**Bone-meal.**—Chiefly a phosphatic manure, but containing also nitrogenous matter. Phosphates range from 44 to 55 per cent, according to the purity of the bones, and are insoluble. The nitrogenous matter is capable of yielding from 4 to 5 per cent ammonia, and is also insoluble. The higher the phosphates the lower the ammonia, and *vice versa*. The finer ground it is the more speedy is its action.

**Bone-dust.**—A coarser ground bone than the preceding.

**Crushed Bones.**—Still coarser ground.

**Steamed Bone Flour.**—Bones which have been subjected to steam at high pressure for the extraction of glue or gelatine. The residue contains from 56 to 65 per cent phosphates, and from 1 to 2 per cent ammonia. It is white-coloured and friable, and can be crushed with the hand. It is able to be, and ought to be, ground to a fine flour.

**Pure Dissolved Bones.**—Bones dissolved in sulphuric acid. It contains usually less than 20 per cent soluble phosphate, about 10 to 20 per cent of insoluble phosphate, and yields about  $3\frac{1}{2}$  per cent ammonia. A large proportion of the insoluble phosphate may consist of "precipitated" phosphate, which is quite as useful as soluble phosphate.

**Pure Vitriolated Bones.**—Bones which have been moistened with sulphuric acid, and thereafter allowed to heat in large heaps. It contains less soluble phosphate and more ammonia than the preceding, and is usually made from more coarsely ground bones.

**Dissolved Bone Manures.**—These are compound manures, consisting of any mixture of phosphatic and nitrogenous materials which can be dissolved, with some admixture of bone, so as to produce a manure containing from 15 to 30 per cent soluble phosphates, and from 1 to 3 per cent ammonia. *Dissolved bone manures* frequently contain some bone material that has not been dissolved.

**Superphosphates.**—Phosphates dissolved with sulphuric acid. Their composition varies according to the richness of the phosphate from which they are made, and the extent to which they have been dissolved. If mixed with nitrate of soda, except in very small quantity, it causes loss from escape of nitrous fumes, which are injurious when breathed.

*High-class superphosphates* are made from phosphates containing a high percentage of phosphate of lime, and are very thoroughly dissolved. They should contain between 35 and 40 per cent soluble phosphate.

*Low-class superphosphates* usually contain 26 to 28 per cent soluble phosphate.

**Mineral Phosphates** exist in great variety, and contain very various proportions of phosphate of lime, viz., from 20 to 90 per cent. They are of use as manures only when they are ground to the finest flour.

**Thomas-Slag, Basic Cinder, or Slag Phosphate Meal.**—A substance obtained as a waste product in the dephosphorising of steel. It contains from 30 to 40 per cent phosphate of lime, and should be manufactured into a powder of extreme fineness, 80 per cent at least passing through No. 100 wire-cloth. It is more soluble and available for plant-food than ground mineral phosphates. It may be mixed with nitrate of soda, but *not with sulphate of ammonia*, because it contains caustic lime.

**Compound Manures.**—These are general manures containing nitrogenous matter, phosphates, and potash, and their value depends not only on the amounts of these constituents, but also on their fineness of division, their solubility, and the sources from which their ingredients are derived.

The general character of a few of the more common of these may be indicated thus :—

**Turnip Compounds.**—These usually contain from 25 to 35 per cent phosphates, of which the half or more is soluble, and nitrogenous matter, capable of yielding from 2 to 5 per cent of ammonia, and sometimes 1 or 2 per cent of potash.

**Potato Compounds.**—These are somewhat like the preceding, but contain usually less phosphate and a little more ammonia (from 4 to 8 per cent); sometimes they contain no potash, but more frequently about 3 or 4 per cent is present, and in some instances twice as much.

**Bean Compounds.**—These may contain from 10 to 20 per cent phosphates, nitrogenous matter yielding from 2 to 4 per cent of ammonia, and usually a considerable proportion of potash, often as much as from 10 to 20 per cent.

**Cereal Compounds.**—These usually contain about 20 per cent phosphates, mostly soluble, and nitrogenous matter, partly as nitrates, yielding from 3 to 8 per cent ammonia, and they may also contain potash.

**Grass Compounds.**—These are somewhat like the preceding, but may contain less phosphates and more nitrogen, part of which is usually in the form of nitrate.



## NOTES REGARDING MANURIAL CONSTITUENTS.

The three important constituents of purchased manures are phosphates, nitrogenous matter, and potash salts.

The phosphates are described in analytical reports as containing phosphoric acid equal to so much "phosphate of lime"; the nitrogenous matter as containing nitrogen equal to so much "ammonia"; the potash salts as containing so much anhydrous "potash."

1. PHOSPHATES.—The phosphates occurring in manures are known to chemists as ortho-phosphates, and they are of three kinds, which may be thus represented—

Lime	} Phosphoric acid.	Lime	} Phosphoric acid.	Lime	} Phosphoric acid.
Lime		Lime		Water	
Lime		Water		Water	
<i>Tricalcic phosphate.</i>			<i>Dicalcic phosphate.</i>		
			<i>Monocalcic phosphate.</i>		

*Tricalcic phosphate* is the natural phosphate occurring in bones and mineral phosphates. It is insoluble in water, and contains about 46 per cent phosphoric acid.

*Monocalcic phosphate* is formed from tricalcic phosphate by dissolving it in acid, which takes away two-thirds of its lime, and replaces it with water. It is soluble in water, and contains about 60 per cent phosphoric acid.

*Dicalcic phosphate* is intermediate between these two, and is formed by their union. This union occurs in the case of phosphates which have been treated with less acid than is required to dissolve them entirely—e.g., in pure dissolved bones, and it is usually called *precipitated* or *reverted* phosphate. It contains about 52 per cent phosphoric acid, is insoluble in water, but soluble in certain saline solutions, and is nearly as active manurally as monocalcic phosphate.

"Soluble phosphate" ought, strictly speaking, to mean monocalcic phosphate, but according to trade usage it does not. It means that amount of tricalcic phosphate which by means of acid has been converted into monocalcic phosphate, or in other words, the insoluble phosphate that has been rendered soluble. There is a certain advantage in expressing all kinds of phosphate in terms of their equivalent of tricalcic phosphate.

Phosphates of magnesia, of iron, and of alumina, when occurring in small proportion, are not usually estimated separately, but are reckoned as phosphate of lime.

2. NITROGEN occurs in manures mostly in three forms—Ammonia salts, nitrates, and albuminoid matter.

Ammonia sulphate (pure), contains  $25\frac{3}{4}$  per cent ammonia.

Ammonium chloride (pure), "  $31\frac{1}{4}$  " "

Nitrate of soda (pure), contains nitrogen equal to 20 per cent ammonia.

Albuminoid matter contains from 14 to 16 per cent nitrogen, equal to from 17 to 19 per cent ammonia, most of which sooner or later becomes available as plant-food.

3. POTASH occurs mostly in the form of soluble salts, and should be reckoned as anhydrous potash ( $K_2O$ ).

Sulphate of potash (pure), contains potassium = 54 per cent anhydrous potash.

Muriate of potash (pure), contains potassium = fully 63 per cent anhydrous potash.

## FEEDING STUFFS—THEIR COMPOSITION AND CHARACTERISTICS.

These are concentrated forms of fodder, whose value depends upon their *albuminoid matter, oil, and carbohydrates* (such as starch and sugar).

**LINSEED** (seed of *Linum usitatissimum*, Common Flax).—Bombay seed large and pale; Baltic seed smaller and dark brown, more liable to impurities than Bombay seed; should be crushed and plotted before feeding. Useful in calf fodders, also for milk-giving, and in the last stage of masting. Quantity, 1 to 3 lb. per 1000 lb. L.W.

**LINSEED-CAKE**.—Much approved feeding cake; merits well known. Home-made cake usually softer and more oily than foreign. Very hard-pressed cake is low in oil, and not so easily eaten and digested. Linseed-cakes usually impure. Chief impurities, locust-beans added to give flavour and relish, rape-seed, less frequently chaff, and weed-seeds from badly screened seed. Should be broken to small pieces before feeding. Quantity, 2 to 6 lb. per 1000 lb. L.W.

**RAPE-CAKE** (seed of *Brassica napus* and *B. campestris*).—It has a greenish mottled appearance and a bitter taste, which renders it distasteful to cattle at first. Should be given in small quantity to begin with. Not suited for calves. When given to milch cows, the quantity should not exceed 2 or 3 lb. per head per day, or it will give a disagreeable taste to milk and butter. Sometimes very impure. A dangerous impurity is mustard-seed. May be detected by steeping in cold water for some hours, and noting smell of mustard. Danger may be avoided by steeping the ground cake in *boiling* water.

**POPPY-CAKE** (seed of *Papaver somniferum*).—Contains a savoury and easily digestible oil. May be fed to cattle in considerable quantity—5 to 8 lb. per head per day. More than 5 lb. per head per day to milch cows detracts from flavour of butter.

**HEMP-CAKE** (seed of *Cannabis sativa*).—Not much used for feeding. Not so digestible as the above, owing to abundance of woody fibre (25 per cent). Fed chiefly to horses and sheep. To milch cows not more than 1 lb. per head per day. Apt to grow mouldy in summer.

**SUNFLOWER-CAKE** (seed of *Helianthus annuus*).—Relished by stock, and well digested.

**COTTON-CAKE** (seed of *Gossypium hirsutum*, &c.) *Uncorticated*.—Best quality from Egyptian and Sea Island seed. Inferior qualities are woolly, and to be avoided. Husk has astringent properties, and is a good cure for *scour*. Should be ground to the size of linseed. Not very digestible, owing to abundance of woody fibre (28 per cent). Should be used freshly made, because liable to mould on keeping.

*Decorticated*.—viz., cotton-cake deprived of the husk.—A very concentrated and powerful bye-fodder. Should be given with caution, crushed fine, and mixed with Indian corn, oats, or other farinaceous food. Large quantity is injurious, and may even be fatal. Very variable in composition. Frequently very hard pressed, and therefore indigestible. When freshly made, softly pressed, and of good quality, it is a valuable bye-fodder. Oil very bland and digestible; used to adulterate olive-oil.

**SESAME-CAKE** (seed of *Sesamum orientale*).—Seed imported from India. Excellent bye-fodder, easily digested, much relished by all kinds of stock. Favourable for milk-giving, and also for masting. Oil bland and digestible, and much in favour for making margarine.

**RICE-MEAL** (seed of *Oryza sativa*).—The meal is a bye-product obtained in preparing rice for the market. A very good, safe, and acceptable fodder, but less concentrated than ordinary oilcakes. Varies very

much in quality, and frequently adulterated with meal derived from rice husks. Much relished by stock, and useful for milch cows as well as for fattening animals.

**RYE-MEAL.**—Is the bran of rye, and rather more concentrated than wheat bran. It is very good fodder for cattle and sheep, but not for horses.

**PALM-KERNEL CAKE.**—An excellent, palatable, and easily digested bye-fodder. Especially good for milch cows. Increases the proportion of fat in milk. Puts a finish upon fattening stock. When ground to powder and most of the oil extracted, it is sold as *Palm-kernel meal*, a much relished and digestible bye-fodder. A useful addition to calf-meals.

**FLESH-MEAL.**—Residue obtained in the manufacture of *Liebig's Extract of Beef*. A highly nitrogenous bye-fodder, most suitable for enriching a too farinaceous dietary, such as potatoes. Much used in that way as a swine fodder. Easily digested, and readily accepted by cattle.

**FISH-MEAL.**—Bye-product of fish-curing yards, made chiefly from the heads of cod and tusk. Resembling fish guano in composition, but somewhat variable. Highly phosphatic, and therefore useful as a bye-fodder to young growing cattle. Ratio, from 1 to 3 lb. per head per day.

**HERRING-MEAL.**—A very oily fodder, useful as an adjunct to the dietary of milch cows. Quantity, 1 to 4 lb. per head per day.

**LOCUST-BEANS**—*Carob Bean*.—A sugary fodder, most palatable and acceptable to all kinds of stock. Used to mix with oilcakes and meals, so as to improve their flavour.

**DRIED GRAINS.**—The draff from distilleries and breweries dried so as to contain only about 10 per cent water. It is a first-class feeding stuff if of good quality, but the qualities differ considerably.

### THE COMPOSITION OF FEEDING STUFFS.

The following is the average composition of genuine cakes and meals in common use:—

	Albuminoids.	Oil.	Carbohydrates.
Linseed-cake . . .	29	11	32
Rape-cake . . .	31	10	30
Poppy-cake . . .	35	10	22
Hemp-cake . . .	30	8½	17
Sunflower-cake . . .	33	9	27
Cotton-cake . . .	28	7½	30
„ (decorticated)	44	15	20
Sesame-cake . . .	37	13	21
Rice-meal . . .	11	10	50
Paisley meal . . .	15	9	60
Rye-meal . . .	14.5	3.5	60
Bran . . .	13.5	3.5	56
Palm-kernel cake . . .	17	10	41
Palm-kernel meal . . .	19	3½	44
Flesh-meal . . .	71	13	...
Fish-meal . . .	50	4	...
Herring-meal . . .	40	20	...
Locust-bean meal . . .	4	2	74
Linseed . . .	21	37	20
Dried grains . . .	20	8	50

## USEFUL FACTORS.

Amount of	Multiplied by	Gives corresponding amount of
Nitrogen . . . . .	1.214	Ammonia.
" . . . . .	6.3	Albuminoid matter.
Ammonia . . . . .	.824	Nitrogen.
" . . . . .	3.882	Sulphate of ammonia.
" . . . . .	3.147	Muriate of ammonia.
" . . . . .	3.706	Nitric acid.
" . . . . .	5.0	Nitrate of soda.
Potash (anhydrous) . . . . .	1.85	Sulphate of potash.
" . . . . .	1.585	Muriate of potash.
Phosphoric acid (anhydrous) . . . . .	2.183	<sup>1</sup> Phosphate of lime.
" " . . . . .	1.4	Biphosphate.
" " . . . . .	1.648	<sup>2</sup> Soluble phosphate.
Soluble phosphate <sup>2</sup> . . . . .	1.325	<sup>1</sup> Phosphate of lime.
Biphosphate . . . . .	1.566	"
Lime . . . . .	1.845	"
" . . . . .	1.786	Carbonate of lime.
Chlorine . . . . .	1.648	Chloride of sodium.

The following are the forms in which analyses of *ordinary genuine* manures and feeding stuffs are usually reported :—

I. REPORTS OF ANALYSES OF *MANURES*.

(*On the left side are the analytical details which may vary in form, and on the right the valuable constituents which must not vary in form, and which alone are considered in estimating the value of manures.*)

## 1. Form of Analysis for SUPERPHOSPHATES, DISSOLVED BONES, and the like.

*Capable of yielding as valuable constituents.*

Phosphoric acid, soluble .....	Phosphates of lime dissolved	} .....
Do., in an insoluble state.....	Do. do. undissolved	
Lime . . . . .	} .....	
Sulphuric acid, organic matter, &c. . . . .		
Sand and insoluble matter.....	Ammonia	

## 2. Form of Analysis for BONES, BONE-MEAL, FISH GUANO, and the like.

*Capable of yielding as valuable constituents*

Phosphoric acid . . . . .	Phosphate of lime . . . . .	
Lime . . . . .	} .....	
Alkalies, &c. . . . .		
Organic matter . . . . .	Ammonia . . . . .	
Moisture . . . . .		
Sand and insoluble matter.....		

<sup>1</sup> Tricalcic ortho-phosphate ( $3\text{CaO}$ ,  $\text{P}_2\text{O}_5$ ).

<sup>2</sup> Monocalcic ortho-phosphate ( $\text{CaO}$ ,  $2\text{H}_2\text{O}$ ,  $\text{P}_2\text{O}_5$ ).

### 3. Form of Analysis for MIXED MANURES, PERUVIAN and ICHABOE GUANOS, and the like.

Phosphoric acid, soluble .....	Capable of yielding as valuable constituents.
Do., in an insoluble state .....	Phosphate of lime dissolved } .....
Lime . . . . .	Do. do. undissolved }
Alkalies, &c. } .....	Potash . . . . .
Organic and volatile matter . . . . .	Total nitrogen, = ammonia . . . . .
Moisture . . . . .	
Sand and insoluble matter....	

### II. REPORTS OF ANALYSES OF FEEDING STUFFS.

Valuable Constituents	{ Albuminoid compounds .....	= Nitrogen .....
	{ Oil . . . . .	
	{ Carbohydrates . . . . .	
	{ Woody fibre . . . . .	
	{ Moisture . . . . .	
	{ Ash . . . . .	

## FORMS OF GUARANTEE.

### GUARANTEE OF MANURE.

I guarantee that the manure called..... and sold by me to  
 .....contains a minimum of—

*Soluble phosphoric acid* = Phosphate of lime dissolved.....per cent.  
*Insoluble phosphoric acid* = Phosphate of lime undissolved.....per cent.  
*Potash salts* . . . = Potash ( $K_2O$ ) . . . . .per cent.  
*Total nitrogen* . . . = Ammonia . . . . .per cent.

Signature of seller.....

Date.....18...

### GUARANTEE OF FEEDING STUFF.

I guarantee that the feeding stuff called..... and sold by me to  
 .....contains a minimum of—

..... per cent albuminoids.  
 ..... per cent oil.  
 ..... per cent carbohydrates.

Signature of seller.....

Date.....18...



# UNITS TO BE USED IN DETERMINING THE COMMERCIAL VALUE OF MANURES.<sup>1</sup>

*Terms*—CASH, including Bags gross weight—not including Carriage.

*N.B.*—These units are based on the present RETAIL PRICES at port. When these units are multiplied by the percentages in the analysis of a Manure, they will produce a value representing very nearly the cash price at which one SINGLE TON may be bought in fine sowable condition. Larger purchases may be made on more favourable terms.

For Season 1892.

Items to be Valued.	Guanos.		Scrap Manures.		Bone-Meal.			Steamed Bone Flour.	Dissolved or Vitriolated Bones.	Superphosphates.	Dissolved Compounds.		
	Ichaboe.	Peruvian (Ritileu).	Fish Guano.	Frey-Bentos Guano.	a.	b.	c.	a.			From	To	Average.
Phosphates dissolved	..	..	..	..	..	..	..	..	2/9	2/1	2/1	2/9	2/4
Phosphates undissolved	2/6	2/2	1/6	1/6	1/6	1/5	1/4	1/6	1/6	..	1/4	2/-	1/6
Ammonia	17/-	15/-	10/6	12/6	10/6	10/6	10/-	9/6	10/6	12/-	10/-	12/-	11/-
Potash	..	4/-	..	..	..	..	..	..	..	..	3/0	4/3	4/-

## CLASSIFICATION OF MANURES.

Fish guano . . .	Finely ground, and containing not more than 3 per cent oil.
Frey-Bentos guano . . .	(a) Meat-meal, free from horn, yielding over 13 per cent ammonia. (b) Mixed scrap, yielding 7 to 8 per cent ammonia, and 30 to 40 per cent phosphates.
Bone-meal . . .	(a) 90 per cent passing $\frac{1}{8}$ -inch sieve. (b) 90 per cent passing $\frac{1}{4}$ -inch sieve. (c) Coarser. Genuine bone-meal contains from 45 per cent to 55 per cent phosphates, and from 4 per cent to 5 per cent ammonia.
Steamed bone-flour . . .	Bones degelatinised and ground to flour containing about 60 per cent phosphates, and about 2 per cent ammonia.
Pure dissolved bones . .	Containing nothing but natural bones and sulphuric acid.
Dissolved compounds	Including dissolved-bone manures and all special manures consisting of ingredients mixed together and dissolved as a whole. The "Average" units should be used in valuing ordinary well-made dissolved compounds. If the manure is of superior manufacture and of high concentration, the units used should be above the average; if of inferior manufacture, or of low concentration, the units used should be below average. In valuing such manures for Associations, the units employed must be specified.
Mixtures . . .	To be valued according to the unit values (as given above) of the ingredients of which they are guaranteed and also found to be composed, with an addition of from 5 to 10 per cent, according to the fineness of their manufacture.

Local Analytical Associations receiving grants from the Society must not use other units than these in valuing manures.

<sup>1</sup> See note, p. 43.

## CASH PRICES (FEBRUARY).

MANURES.			
	Guarantee.	Price per Ton.	Unit.
Sulphate of ammonia, 97 per cent . . . . .	Per cent. 24 Am.	£ s. d. 10 10 0	Am. = 8/9
Nitrate of soda, 95 per cent . . . . .	19 "	9 10 0	" = 10/
Castor-cake dust . . . . .	5.5 "	3 15 0	" = 13/6
Horn-dust . . . . .	15 "	9 0 0	" = 12/
Dried blood . . . . .	15 "	8 5 0	" = 11/
Muriate of potash, 80 per cent . . . . .	50 Pot.	8 10 0	Pot. = 3/5
Sulphate of potash, 50 per cent . . . . .	27 "	5 10 0	" = 4/1
Kainit . . . . .	12 "	2 5 0	" = 3/9
Nitrate of potash, 73 per cent . . . . .	{ 14 Am. 40 Pot. }	{ 14 10 0 }	{ Am. = 10/ Pot. = 3/9 }
Ground Charleston phos. . . . .	57 Phos.	3 10 0	Phos. = 1/3
Belgian phosphate . . . . .	50 "	2 15 0	" = 1/1
Thomas-slag (fine) Scotch . . . . .	30 "	1 12 6	" = 1/1
" " " English . . . . .	37 "	2 0 0	" = 1/1
Phosphatic Guano . . . . .	{ 67 " 1 Am. }	{ 5 5 0 }	{ " = 1/5 } Am. = 10/ }

FEEDING STUFFS.				Price per Ton in bags.
	Analyses.			
	Album.	Oil.	Carbo- hydrates.	
Linseed-cake . . . . .	28	10	35	£ s. d. 9 0 0
Decorticated cotton-cake . . . . .	45	8	20	7 10 0
Undecorticated do. . . . .	24	7	25	5 10 0
Liebig's meat-meal . . . . .	70	12	..	10 0 0
Rape-cake . . . . .	32	10	27	5 15 0
Bean-meal . . . . .	25	2	50	8 5 0
Locust-bean meal . . . . .	6	2	70	7 0 0
Dried grains . . . . .	20	8	50	5 10 0
Indian corn . . . . .	10	5	55	5 5 0
Paisley meal . . . . .	15	9	60	5 5 0
Linseed (whole) . . . . .	20	35	14	13 10 0
Linseed-oil . . . . .	..	..	..	19 0 0
Molasses . . . . .	..	..	..	5 10 0



## INSTRUCTIONS FOR VALUING MANURES.

The commercial values of manures are determined by means of the UNITS in the following manner:—

Take the analysis of the manure, and look for the following substances:—

Phosphates dissolved (or soluble phosphate)	} No other items but these are to be valued.
" undissolved (or insoluble " )	
Ammonia . . . . .	
Potash . . . . .	

*Should the analysis or the guarantee not be expressed in that way, the chemist or the seller should be asked to state the quantities in these terms.*

Suppose the manure is bone-meal:—

There are three classes of bones, according to their fineness. An ordinary bone-meal will fall under Class (b), and it will contain about 50 per cent phosphate, and  $4\frac{1}{2}$  per cent ammonia. The units for bones, Class (b), are 1s. 5d. for insoluble phosphate, and 10s. for ammonia. Therefore the value is—

Insol. phosphate, 50 times 1s. 5d., equal to	£3 10 10
Ammonia, $4\frac{1}{2}$ " 10s. " "	2 5 0

Say £5 16 0 per ton.

Suppose the manure is dissolved or vitriolated bones:—

It must be guaranteed "pure."

The units in the Schedule are 2s. 9d. for soluble phosphate, 1s. 6d. for insoluble phosphate, and 12s. for ammonia.

The analysis will be about 15 per cent soluble phosphate, 20 per cent insoluble phosphate, and 3 per cent ammonia. In that case the value would be—

Sol. phosphate, 15 times 2s. 9d., equal to	£2 1 3
Insol. " 20 " 1s. 6d. " "	1 10 0
Ammonia, 3 " 12s. " "	1 16 0

Say £5 7 0 per ton.

Suppose the manure is a superphosphate,—say an ordinary superphosphate, with 27 per cent soluble phosphate and 3 per cent insoluble phosphate. It is valued thus—

Sol. phosphate, 27 times 2s. 1d., equal to, say, £2 16 3 per ton.

*Insoluble phosphate is not valued in a superphosphate.*

Suppose the manure is a dissolved compound, such as *dissolved-bone manures*, or a special manure, such as a *turnip or potato manure*, it will be valued according to the units under "Dissolved Compounds," the *average* units for which are 2s. 4d. for soluble phosphate, 1s. 6d. for insoluble phosphate, 11s. for ammonia, and 4s. for potash, in the Schedule. Thus, an ordinary turnip manure containing 20 per cent soluble phosphate, 10 per cent insoluble phosphate, 4 per cent ammonia, and 2 per cent potash, would be valued thus—

Sol. phosphate, 20 times 2s. 4d., equal to	£2 6 8
Insol. do, 10 " 1s. 6d., " "	0 15 0
Ammonia, 4 " 11s. " "	2 4 0
Potash, 2 " 4s. " "	0 8 0

Say £5 14 0 per ton.

*Note.*—The units have reference solely to the COMMERCIAL VALUES of Manures, and not to their AGRICULTURAL VALUES.

*Thus, in stating soluble phosphate in dissolved bones at 2s. 9d. per unit, and that in superphosphate at 2s. 1d., it is meant that these are the prices per unit at which soluble phosphate can be bought in these two manures; but it does not mean that the soluble phosphate in the one is 8d. per unit better as a manure than that in the other. It is probably no better.*

## BOTANICAL DEPARTMENT.

*Consulting Botanist to the Society*—A. N. M'ALPINE, Minto House,  
Chambers Street, Edinburgh.

The Society have fixed the following rates of charge for the examination of plants and seeds for the *bona fide* and individual use and information of members of the Society (not being seedsmen), who are particularly requested, when applying to the Consulting Botanist, to mention the kind of examination they require, and to quote its number in the subjoined schedule. The charge for examination must be paid at the time of application, and the carriage of all parcels must be prepaid.

### *Scale of Charges.*

1. A report on the purity, amount, and nature of foreign materials, 2s.
2. On the germinating power of a sample of seed, 2s.
3. Determination of the species of any weed or other plant, or of any vegetable parasite, with a report on its habits and the means for its extermination or prevention, 5s.
4. Report on any disease affecting farm crops, 5s.
5. Determination of the species of any natural grass or fodder plant, with a report on its habits and pasture or feeding value, 1s.

The Consulting Botanist's Reports are furnished to enable members—purchasers of seeds and corn for agricultural purposes—to test the value of what they buy, and are not to be used or made available for advertising or trade purposes by seedsmen or otherwise.

### *Instructions for Selecting and Sending Samples.*

In sending seed or corn for examination, the utmost care must be taken to secure a fair and honest sample. In the case of grass seeds, the sample would be drawn from the centre of the sack or bag, and in all cases from the bulk delivered to the purchaser. If anything supposed to be injurious or useless exists in the corn or seed selected, samples should also be sent.

When possible, at least one ounce of grass and other small seeds should be sent, and two ounces of cereals or larger seeds. The exact name under which the seed has been bought (but preferably, a copy of the invoice) should accompany the sample.

Grass seeds should be sent at least four weeks, and clover seeds two weeks, before they are to be used.

In collecting specimens of plants, the whole plant should be taken up and the earth shaken from the roots. If possible, the plants must be in flower or fruit. They should be packed in a light box, or in a firm paper parcel.

Specimens of diseased plants or of parasites should be forwarded as fresh as possible. Place them in a bottle, or pack them in tinfoil or oil-silk.

All specimens should be accompanied with a letter specifying the nature of the information required, and stating any local circumstances (soil, situation, &c.) which, in the opinion of the sender, would be likely to throw light on the inquiry.

It is strongly recommended that members purchasing seeds should insist—

(1) Upon having from the seller a guarantee stating the purity and germination of the seed supplied.

(2) That the bulk be same as sample.

(3) That it contain not more than 5 per cent other than the species ordered.

If the purity and germination of the seed is not known, it is impossible to tell either its money value or the proper amount to be sown.

It is also strongly recommended that the purchase of prepared mixtures should be avoided, and the different seeds to be used should be purchased separately.

Parcels or letters containing seeds or plants for examination (carriage or postage paid) must be addressed to Professor M'Alpine, Botanical Laboratory, Minto House, Chambers Street, Edinburgh.

Grant for grass experiments in 1890, £30.

## DAIRY DEPARTMENT.

The Society established in 1885 a Dairy Department, to promote the dairy interests.

During 1885, 1886, 1887, 1888, 1889, 1890, and 1891, the Society placed at the disposal of the Committee a sum of £100 to aid local efforts in the employment of itinerating Instructors and Demonstrators in Cheese and Butter making.

The grants have been appropriated among the different branches of the Scottish Dairy Associations as follows :—

Branch.	1888.	1889.	1890.	1891.
Ayrshire . . . . .	£37 0 0	...	...	...
Wigtownshire, Rhinns District	} 31 0 0	...	...	...
Wigtownshire, Lower District				
Kirkcudbright . . . . .	22 0 0	...	...	...
Dumfriesshire . . . . .	10 0 0	...	...	...
Royal Northern Society . . . . .	...	...	...	20 0 0
Angus and Mearns Dairy School	...	...	...	20 0 0
Kilmarnock Dairy School . . . . .	...	£100 0 0	£100 0 0	£60 0 0
	£100 0 0	£100 0 0	£100 0 0	£100 0 0

## PREMIUMS.

### GENERAL REGULATIONS FOR COMPETITORS.

1. It is to be distinctly understood that the Society is not responsible for the views, statements, or opinions of any of the writers whose papers are published in the 'Transactions.'

2. All reports must be legibly written, and on one side of the paper only; they must specify the number and subject of the Premium for which they are in competition; they must bear a distinguishing motto, and be accompanied by a sealed letter, similarly marked, containing the name and address of the reporter—initials must not be used.

3. No sealed letter, unless belonging to a report found entitled to at least one-half of the Premium offered, will be opened without the author's consent.

4. Reports for which a Premium, or one-half of it, has been awarded, become the property of the Society, and cannot be published in whole or in part, nor circulated in any manner, without the consent of the Directors. All other papers will be returned to the authors if applied for within twelve months.

5. When a report is unsatisfactory, the Society is not bound to award the whole or any part of a Premium.

6. All reports must be of a practical character, containing the results of the writer's own observation or experiment, and the special conditions attached to each Premium must be strictly fulfilled. General essays, and papers compiled from books, will not be rewarded. Weights and measurements must be indicated by the imperial standards.

7. The Directors, before awarding a Premium, shall have power to require the writer of any report to verify the statements made in it.

8. The decisions of the Board of Directors are final and conclusive as to all Premiums, whether for Reports or at General or District Shows; and it shall not be competent to raise any question or appeal touching such decisions before any other tribunal.

9. The Directors will welcome papers from any Contributor on any suitable subject not included in the Premium List; and if the topic and the treatment of it are both approved, the writer will be remunerated, and his paper published.

## CLASS I.

## REPORTS.

### SECTION 1.—THE SCIENCE AND PRACTICE OF AGRICULTURE.

#### FOR APPROVED REPORTS.

1. On the results of experiments for fixing and retaining the volatile and soluble ingredients in Farmyard Manure—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must detail the treatment adopted to fix and retain these ingredients—the materials used for that purpose, and the quantity and cost thereof—comparative analyses of the manure with and without the treatment, and also a statement of the crops grown with manure and without such treatment, must be given by the Reporter. The experiments to have extended over at least two years and crops.

2. On the results of experiments for ascertaining the comparative value of Farmyard Manure obtained from cattle fed upon different varieties of food, by the application of such manure to farm crops—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must state the effects produced on two successive crops by the application of manure obtained from cattle fed on different sorts of food, such as turnips and straw alone; and turnips and straw, with an addition of oilcake, linseed, bean-meal, grain, or other substances. The animals should be as nearly as possible of the same age, weight, condition, and maturity, and each lot should receive daily the same quantity of litter; and, except as to the difference of food, they must be treated alike.

The preparation of the manure, by fermentation or otherwise, should be in every respect the same; and it is desirable that not less than two several experiments be made with each kind, and that the ground to which it is to be applied be as equal as possible in quality and condition.

3. On the hardy and useful Herbaceous Plants of any country, where such climate exists as to induce the belief that the plants may be beneficially introduced into the cultivation of Scotland

—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Attention is particularly directed to the grains and grasses of China, Japan, the Islands of the Eastern Archipelago, the Himalaya country, the Falkland and South Sea Islands, California, and the high north-western district of America.

Reporters are required to give the generic and specific names of the plants treated of, with the authority for the same—together with the native names, so far as known; and to state the elevation of the locality and nature of the soil in which they are cultivated, or which they naturally inhabit, with their qualities or uses; and it is further requested that the descriptions be accompanied, in so far as possible, with specimens of the plants, and their fruit, seed, and other products.

4. On the comparative advantages of Feeding Home-bred or Canadian Cattle—Ten Sovereigns. To be lodged by 1st November 1893.

The writer's own practical experience to be stated, and five of each class to be reported on.

5. On the comparative advantages of Fattening Cattle in stalls, courts, or covered yards—Twenty Sovereigns. To be lodged by 1st November in any year.

The Report must detail the comparative result of actual experiments. The same quantities and kinds of food must be used. Information is required as to the comparative expense of attendance, the cost of erecting the buildings, and any other circumstances deserving of attention. The state of the weather during the experiment, in point of temperature and wetness, and the advantages or disadvantages of clipping cattle put up to feed, must be particularly noted and reported.

6. On experiments for ascertaining the actual addition of weight to growing or fattening Stock, by the use of different kinds of food—Twenty Sovereigns. To be lodged by 1st November in any year.

The attention of the experimenter is directed to turnips, carrots, beet, mangel-wurzel, potatoes, cabbage, as well as to beans, oats, barley, Indian corn, linseed, oilcake or rape-cake, and to the effect of warmth and proper ventilation, and the difference between food cooked and raw. The above roots and other kinds of food are merely suggested; competitors are neither restricted to them nor obliged to experiment on all of them.

When experiments are made with linseed and cake, attention should be paid to the comparative advantages, economically and otherwise, of the substance in these two states.

Before commencing the comparative experiments, the animals must be fed alike for some time previously.

The progress of different breeds may be compared. This will form an interesting experiment of itself, for Reports of which encouragement will be given.

N.B.—The experiments specified in the two previous subjects must be conducted over a period of not less than three months. No lot shall consist of fewer than four Cattle or ten Sheep. The animals selected should be of the same age, sex, and breed, and as nearly as possible of the same weight, condition, and maturity. The live weight before and after the experiment must be stated, and if killed, their dead weight and quantity of tallow.

7. On Dairy Management, giving the most approved systems of Butter and Cheese Making, the use of the Thermometer, and the best Dairy Utensils—Ten Sovereigns. To be lodged by 1st November 1892.

The Report must be thoroughly practical, and embrace the writer's own experience of butter and cheese making.

8. On the comparative Feeding Value of Ensilage, alone or with other ordinary Farm produce—Fifteen Sovereigns. To be lodged by 1st February 1893.

The Report must detail the comparative result of actual experiments; and the same quantities and kinds of food must be used.

9. On any useful practice in Rural Economy adopted in other countries, and susceptible of being introduced with advantage into Scotland—The Gold Medal. To be lodged by 1st November in any year.

The purposes chiefly contemplated by the offer of this premium is to induce travellers to notice and record such particular practices as may seem calculated to benefit Scotland. The Report to be founded on personal observation.

## SECTION 2.—ESTATE IMPROVEMENTS.

### FOR APPROVED REPORTS.

1. By the Proprietor in Scotland who shall have executed the most judicious, successful, and extensive Improvement—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

Should the successful Report be written for the Proprietor by his resident factor or farm manager, a Minor Gold Medal will be awarded to the writer in addition to the Gold Medal to the Proprietor.

The merits of the Report will not be determined so much by the mere extent of the improvements, as by their character and relation to the size of the property. The improvements may comprise reclaiming, draining, enclosing, planting, road-making, building, and all other operations proper to landed estates. The period within which the operations may have been conducted is not limited, except that it must not exceed the term of the Reporter's proprietorship.

2. By the Proprietor in Scotland who shall have erected on his estate the most approved Farm-buildings—The Gold Medal. Reports, Plans, and Specifications to be lodged by 1st November in any year.

3. By the Proprietor or Tenant in Scotland who shall have reclaimed within the ten preceding years not less than forty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

4. By the Tenant in Scotland who shall have reclaimed within the ten preceding years not less than twenty acres of Waste Land—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

5. By the Tenant in Scotland who shall have reclaimed not less than ten acres within a similar period—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Reports in competition for Nos. 3, 4, and 5 may comprehend such general observations on the improvement of waste lands as the writer's experience may lead him to make, but must refer especially to the lands reclaimed—to the nature of the soil—the previous state and probable value of the subject—the obstacles opposed to its improvement—the details of the various operations—the mode of cultivation adopted—and the produce and value of the crops produced. As the required extent cannot be made up of different patches of land, the improvement must have relation to one subject; it must be of profitable character, and a rotation of crops must have been concluded before the date of the Report. *A detailed statement of the expenditure and return* and a certified measurement of the ground are requisite.

6. By the Proprietor or Tenant in Scotland who shall have improved within the ten preceding years the Pasturage of not less than thirty acres, by means of top-dressing, draining, or otherwise, without tillage, in situations where tillage may be inexpedient—The Gold Medal, or Ten Sovereigns. To be lodged by 1st November in any year.

7. By the Tenant in Scotland who shall have improved not less than ten acres within a similar period—The Minor Gold Medal. To be lodged by 1st November in any year.

Reports in competition for Nos. 6 and 7 must state the particular mode of management adopted, the substances applied, the elevation and nature of the soil, its previous natural products, and the changes produced.

### SECTION 3.—HIGHLAND INDUSTRIES AND FISHERIES.

#### FOR APPROVED REPORTS.

1. The best mode of treating native Wool; cleaning, carding, dyeing, spinning, knitting, and weaving by hand in the Highlands and Islands of Scotland—Five Sovereigns. To be lodged by 1st November 1892.

2. The best means of utilising the Sprat Fisheries—Five Sovereigns. To be lodged by 1st November 1892.

### SECTION 4.—MACHINERY.

#### FOR APPROVED REPORTS.



## SECTION 5.—FORESTRY DEPARTMENT.

## FOR APPROVED REPORTS.

1. On Plantations of not less than eight years' standing formed on deep peat-bog—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November 1892.

The premium is strictly applicable to deep peat or flow moss; the condition of the moss previous to planting, as well as at the date of the Report, should, if possible, be stated.

The Report must describe the mode and extent of the drainage, and the effect it has had in subsiding the moss—the trenching, levelling, or other preliminary operations that may have been performed on the surface—the mode of planting—kinds, sizes, and number of trees planted per acre—and their relative progress and value, as compared with plantations of a similar age and description grown on other soils in the vicinity.

2. On the more extended introduction of hardy, useful, or ornamental Trees, which have not hitherto been generally cultivated in Scotland—The Medium Gold Medal, or Five Sovereigns. To be lodged by 1st November in any year.

The Report should specify as distinctly as possible the kind of trees introduced. The adaptation of the trees for use or ornament, and their comparative progress, should be mentioned. Attention is directed to the introduction of any tree as a nurse in young plantations, which by growing rapidly for several years, and attaining maturity when at the height of 20 or 25 feet, might realise the advantage and avoid the evils of thick planting.

3. On the Life-History of any Insect or Tribe of Insects which is injurious to British Forest Trees (*e.g.*, *Scolytus destructor*, of the Elm)—Fifteen Sovereigns. To be lodged by 1st November 1892.

The means for guarding against or destroying these pests to be mentioned, and the Report to be illustrated by original drawings and specimens of the insect and its ravages.

The *Pine Beetle* and the *Fir Weevil* are excluded, having been already reported on.

## CLASS II.

### DISTRICT COMPETITIONS.

#### REGULATIONS 1892.

*The Money Premiums and Medals awarded at District Competitions will be sent direct to the winners in January next. No payments must therefore be made by the Secretary or Treasurer of any local Association.*

*Grants in aid of DISTRICT COMPETITIONS for 1893 must be applied for before 1st November 1892, on Forms to be obtained from the Secretary.*

*When a Grant has expired, the District cannot apply again for aid for two years.*

### SECTION I.—GRANTS TO DISTRICT SOCIETIES FOR HORSES, CATTLE, SHEEP, AND PIGS.

1. CLASS OF STOCK—LIMIT OF GRANTS, £340.—The Highland and Agricultural Society will make Grants to District Societies to deal with, as in the opinion of the District Societies the need of each district may require, for such classes of breeding Stock of Horses, Cattle, Sheep, and Pigs as are embraced in the General Show Prize List of the Highland and Agricultural Society. The total sum to be expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £340 in any one year.

2. GRANT TO DISTRICT, £12.—The portion of the Grant to any one District Society shall not exceed the sum of £12 in any one year.

3. CONTINUANCE OF GRANT THREE YEARS—ADVERTISING.—The Grant shall continue for three alternate years, provided always that the District Society shall, in the two intermediate years, continue the competition by offering Premiums equal in amount to not less than one-half the sum given by the Highland and Agricultural Society, and for the same class of Stock as that selected in each previous year to compete for the Highland and Agricultural Society's Prizes. The Prizes when given by the Highland and Agricultural Society must be announced as their gift. If no competition takes place for two years the Grant expires.

4. When it is agreed to hold the General Show of the Society in any district, no provincial show shall be held in that district in the months of June, July, or August.

5. MEDALS.—In the two alternate years the Highland and Agricultural Society will place three Minor Silver Medals at the disposal of the District Societies, for the same classes of Stock as those for which the Money Premiums are offered, provided that not less than three lots are exhibited in the same class.

6. RULES OF COMPETITION.—The Rules of Competition for the Premiums, the Funds for which are derived from Grants of the Highland and Agricultural Society, shall be such as are generally enforced by the Society receiving the Grant for Premiums offered by itself.

7. AREA AND PARISHES—FIVE PARISHES.—When making application for Grants from the Highland and Agricultural Society, the District Society must delineate the area and the number of parishes comprised in the district, and *except in special cases*, no District Society shall be entitled to a Grant whose show is not open to at least five Parishes.

8. NOMINATION OF MEMBERS.—At the time of making a Grant to a District Society, the Directors shall nominate one or more members of the Highland and Agricultural Society resident in the district, whose

duty it shall be to see that the conditions imposed by the Board are complied with.

9. **REPORTS.**—Blank Reports will be furnished to the Secretaries of the different District Societies. These Reports must in all details be completed and lodged with the Secretary of the Highland and Agricultural Society on or before the 1st of November next following the competition, both in the years when the Grant is given and in the two intermediate years, for the approval of the Directors of the Highland and Agricultural Society, against whose decision there shall be no appeal. All such Reports must be signed and certified by the Members of the Highland and Agricultural Society nominated under Rule 7.

10. **GRANTS—WHEN PAID.**—The Grants made to District Societies will be paid in the January following the competition, by Precepts issued by the Directors of the Highland and Agricultural Society to the winners of the prizes. No payments of these Grants must be made by the Secretary or Treasurer of any District Society. Medals will be issued at the same time.

11. **RENEWAL OF APPLICATION.**—No application for renewal of a Grant to a District Society will be entertained until the expiration of *two years* from the termination of the last Grant.

12. **DISPOSAL OF APPLICATIONS.**—In disposing of applications for District Grants, the Directors of the Highland and Agricultural Society shall keep in view the length of interval that has elapsed since the expiration of the last Grant, giving priority to those District Societies which have been longest off the list.

13. **DAIRY PRODUCE.**—Upon application being made by District Societies, a limited number of Medals will be placed at the Disposal of District Societies for Dairy Produce.

## DISTRICTS.

1. **GARIOCH.**—*Convener*, Alex. M. Gordon, of Newton, Inch; *Secretary*, William Home, Newton of Ardoyne, Inch. Granted 1887. (In abeyance in 1888.)
2. **DALBEATTIE.**—*Convener*, Wellwood H. Maxwell of Munches; *Secretary*, R. W. Macnab, Union Bank, Dalbeattie. Granted 1887. (In abeyance in 1888.)
3. **DEESIDE UNION.**—*Convener*, Colonel Innes of Learney, Aberdeen; *Secretary*, James Shaw, Tillyching, Lumphanan. Granted 1888.
4. **TURRIFF.**—*Convener*, A. Stuart of Laithers, Turriff; *Secretary*, R. Cruickshank, Claymires, Turriff. Granted 1888.
5. **BIGGAR.**—*Convener*, R. G. Murray, Spittal, Biggar; *Secretary*, John H. Wilson, Biggar. Granted 1888.
6. **BREADALBANE.**—*Convener*, Archibald M'Dougall, Ardtalnaig; *Secretary*, R. A. Robertson, Bank of Scotland, Killin. Granted 1888.
7. **EASTERN DISTRICT OF STIRLINGSHIRE.**—*Convener*, Ralph Stark of Summerford, Falkirk; *Secretary*, Thos. Binnie, Auctioneer, Falkirk. Granted 1888.
8. **KINCARDINESHIRE.**—*Convener*, John Hart, Cowie Mains, Stonehaven; *Secretary*, A. B. Annandale, Stonehaven. Granted 1892.
9. **SPEY, AVEN, AND FIDDOCHSIDE.**—*Convener*, Sir George Macpherson Grant of Ballindalloch, Bart.; *Secretary*, A. R. Stuart of Inverfiddich, Craigellachie. Granted 1891.
10. **WESTER ROSS.**—*Convener*, Major Randle Jackson of Swordale, Evanston; *Secretary*, David Ross, Dingwall. Granted 1888.
11. **JED-FOREST.**—*Convener*, Gideon Pott, Knowesouth, Jedburgh; *Secretary*, Richard Davidson, Swinnie, Jedburgh. Granted 1891.

12. LAMMERMOOR PASTORAL.—*Convener*, Richard Stephenson, Chapel, Duns; *Secretary*, A. M. Caverhill, Crichton, Duns. Granted 1888. (In abeyance in 1890.)

In 1892.

Nos. 1, 2, 3, 4, 5, 6, and 7 are in competition for the last year.  
 No. 8 is in competition for the first year.  
 Nos. 9 and 10 are in abeyance on account of the Inverness Show.  
 Nos. 11 and 12 compete for local Premiums.

## SECTION 2.—GRANTS TO HORSE ASSOCIATIONS, &c., FOR STALLIONS FOR AGRICULTURAL PURPOSES.

1. HORSES—LIMIT OF GRANT, £210.—The Highland and Agricultural Society will make Grants to Horse Associations and other Societies in different districts engaging Stallions for agricultural purposes. The total sum expended by the Highland and Agricultural Society in such Grants shall not exceed the sum of £210 in any one year.

2. GRANT TO EACH, £15.—The portion of the Grant to any one Horse Association, &c., shall not exceed the sum of £15 in any one year.

3. CONTINUANCE OF GRANT THREE YEARS—INTERMEDIATE YEAR.—The Grant shall continue for three alternate years, provided always that the Horse Association or Society shall, in the two intermediate years, offer at least a sum equal in amount to that granted by the Highland and Agricultural Society for the hire of a Horse in connection with the Association or Society to whom the Grant is made.

4. NOMINATION OF MEMBERS.—At the time of making the Grant to a Horse Association or Society, the Directors of the Highland and Agricultural Society shall nominate one or more members of the Highland and Agricultural Society, resident in the Districts in which the Society benefited is located, whose duty it shall be to see that the conditions imposed by the Board are complied with.

5. REPORTS—PENALTY FOR NOT ENGAGING HORSE.—No grant by the Highland and Agricultural Society to Horse Associations, &c., will be paid unless a report, signed and certified by the members appointed under Rule 4, be furnished to the Highland and Agricultural Society not later than the 1st of November in each year in which the Grant is made, and also in the alternate years, stating that a Horse has been engaged by the Horse Association or other Society to whom the Grant is made; and in the event of a Horse not being engaged in any one year while the provisions of the Grant are in force, the Grant made by the Highland and Agricultural Society will cease.

RULES 9 (Time of Payment), 10 (Renewal of Grant), and 11 (Disposal of Applications) applicable to Section 1, shall be applicable to Section 2.

## DISTRICTS.

1. LOCKERBIE.—*Convener*, Robert Smith, Dalfriddle, Dumfries; *Secretary*, J. R. Byers, Victoria Square, Lockerbie. Granted 1888.
2. WESTERN DISTRICT OF MID-LOTHIAN.—*Convener*, James Paterson of Bankton, Mid-Calder; *Secretary*, John T. Mungle, West Calder. Granted 1888.
3. DALBEATTIE DISTRICT HORSE SOCIETY.—*Convener*, John Frazer, Maxwellfield, Dumfries; *Secretary*, Thomas Smith, Terrona, Langholm. Granted 1888.
4. NAIRNSHIRE.—*Convener*, R. Anderson of Lochdhu, Nairn; *Secretary*, John Joss, Budgate, Cawdor, Nairn. Granted 1891.

5. ELGIN AND NORTHERN DISTRICT CLYDESDALE HORSE SOCIETY.—*Convener*, William Robertson, Linkwood, Elgin; *Secretary*, James Sutor, Solicitor, Elgin. Granted 1889.
6. LANARK CLYDESDALE HORSE SOCIETY, AND UPPER WARD OF LANARKSHIRE.—*Convener*, James Renton, Cleghorn, Lanark; *Secretary*, Wm. Elliot, Markgreen, Lanark. Granted 1889.

In 1892.

Nos. 1, 2, and 3 are in competition for the last year.

Nos. 4, 5, and 6 compete for local Premiums.

### DAIRY PRODUCE.

Upon application being made by District Societies, a limited number of Medals will be placed at the disposal of District Societies for Dairy Produce.

### SPECIAL GRANTS.

- £20 to the Ayrshire Agricultural Association, to be competed for at the Dairy Produce Show at Kilmarnock.—*Convener*, The Hon. G. R. Vernon, M.P., Auchans House, Kilmarnock; *Secretary*, James M'Murtrie, Ayr. Granted 1872.
- £3 to Orkney.—*Secretary*, James Johnston, Orphir House, Orkney. Granted 1883.
- £3 to Orkney Horse-Breeding Society.—*Convener*, James Drever, Swanny House, Finstown; *Secretary*, Robert Scarth, Binscarth, Finstown. Granted 1892.
- £3 to Rousay.—*Convener*, General Burroughs of Rousay, C.B.; *Secretary*, R. Mainland, Banks, Frotoft, Rousay. Granted 1883.
- £3 to South Uist and Barra.—*Convener and Secretary*, Donald Paterson, Askernish, South Uist, Oban. Granted 1890.
- £3 to North Uist.—*Convener*, Sir John Campbell Orde, Bart.; *Secretary*, James M. Fraser, Banker, Lochmaddy. Granted 1890.

### MEDALS IN AID OF PREMIUMS GIVEN BY LOCAL SOCIETIES.

The Society, being anxious to co-operate with local Associations, will give a limited number of Minor Silver Medals annually to Societies, not on the list of Cattle, Horse, or Sheep Premiums, in addition to the Money Premiums awarded in the Districts for—

1. Best Bull, Cow, Heifer of any pure breed, or Ox.
2. Best Stallion, Mare, or Gelding.
3. Best Tup, or Pen of Ewes or Wethers.
4. Best Boar, Sow, or Pig.
5. Best Coops of Poultry.
6. Best Sample of any variety of Wool.
7. Best Sample of any variety of Seeds.
8. Best managed Farm.
9. Best managed Green Crop.
10. Best managed Hay Crop.
11. Best managed Dairy.
12. Best Sweet-Milk Cheese.
13. Best Cured Butter.

14. Best sample of Honey, not less than 5 lb., taken without destroying the bees.
15. Best collection of Roots.
16. Best kept Fences.
17. Male Farm Servant who has been longest in the same service, and who has proved himself most efficient in his duties, and to have invariably treated the animals under his charge with kindness.
18. Female Servant in charge of Dairy and Poultry who has been longest in the same service, and who has proved herself most efficient in her duties, and to have invariably treated the animals under her charge with kindness.
19. Best Sheep-Shearer.
20. Most expert Hedge-Cutter.
21. Most expert Labourer at Draining.
22. Most expert Farm Servant at trial of Reaping-Machines.
23. Best Maker of Oat-Cakes.

It is left to the local Society to choose out of the foregoing list the classes for which the Medals are to be competed.

The Medals are granted for two years.

In 1889 it was resolved that in future no Society shall receive more than two Medals for two years.

#### *Aberdeenshire.*

1. CLUNY, MONYMUSK, AND MIDMAR. — *Convener*, Ranald Macdonald, Cluny Castle, Aberdeen; *Secretary*, James Christie, Backhill of Castle Fraser, Kemnay. 2 Medals. 1891.
2. INVERURIE. — *Convener and Secretary*, James Stephen, Conglass, Inverurie. 2 Medals. 1892.
3. YTHANSIDE. — *Convener*, Robert Copland, Mill of Ardlathen, Ellon; *Secretary*, J. Johnstone, Drumwhindle Mains, Ellon. 2 Medals. 1891.

#### *Argyllshire.*

4. KILFINAN. — *Convener*, George Lyon, Kildavaig, Ardlamont, Greenock; *Secretary*, Neil Nicolson, Auchgoyle, Tigh-na-bruaich. 2 Medals. 1891.
5. LORN. — *Convener*, A. J. H. Campbell of Dunstaffnage, Oban; *Secretary*, J. D. Sutherland, Solicitor, Oban. 2 Medals. 1891.
6. NETHER LORN. — *Convener*, John Gillies, Barnacarrie, Kilninver, Oban; *Secretary*, Peter Fisher, Kilbrandon, Oban. 2 Medals. 1892.

#### *Ayrshire.*

7. DUNDONALD. — *Convener and Secretary*, John Caldwell, Bogside, Dundonald, Dregthorn. 2 Medals. 1892.
8. FENWICK. — *Convener*, Gavin Allan, Whiteleahill, Newmilns; *Secretary*, Robert Young, Tanniecreef, Fenwick. 2 Medals. 1892.
9. IRVINE. — *Convener*, William Sloan, Brieryside, Monkton; *Secretary*, A. C. M'Jannet, Writer, Irvine. 2 Medals. 1886. (In abeyance in 1890 and 1891.)
10. KILBIERNIE. — *Convener*, John Kerr, Newhouse, Kilbirnie; *Secretary*, John Howie, Connelstone, Kilbirnie. 2 Medals. 1892.

11. KILMARNOCK.—*Convener and Secretary*, James Wilson, Kilmarnock. 2 Medals. 1890. (In abeyance in 1890.)
12. MUIRKIRK.—*Convener*, James Johnstone, Alloway Cottage, Ayr; *Secretary*, Alex. Donald, The Schoolhouse, Muirkirk. 2 Medals. 1891.

*Bute.*

13. BUTE.—*Convener*, Archd. M. Mackay, Bruchag, Rothesay; *Secretary*, Thomas W. Alexander, County Buildings, Rothesay. 2 Medals. 1891.

*Dumfriesshire.*

14. MOFFAT AND UPPER ANNANDALE.—*Convener*, James Johnstone, Hunterheck, Moffat; *Secretary*, John Young, Moffat. 2 Medals. 1890. (In abeyance in 1891.)
15. SANQUHAR.—*Convener*, Abram Kerr, Castlehill, Durrisdeer, Thornhill; *Secretary*, Walter Robson, British Linen Company Bank, Sanquhar. 2 Medals. 1892.

*Elginshire.*

16. FORRES AND NORTHERN FAT CATTLE CLUB.—*Convener*, John M'Kessack, Kinloss, Forres; *Secretary*, William Fraser, Waterford Mills, Forres. 2 Medals. 1892.

*Fifeshire.*

17. BALLINGRY AND AUCHTERDERRAN.—*Convener*, James Auchterlonie, Dothan, Kirkcaldy; *Secretary*, George Constable, Glencraig, Lochgelly. 2 Medals. 1891.

*Haddingtonshire.*

18. UNITED EAST LOTHIAN.—*Convener*, Charles Smith, Whittinghame, Prestonkirk; *Secretary*, Andrew Gemmell, Haddington. 2 Medals. 1891.

*Inverness-shire.*

19. GLENURQUHART.—*Convener and Secretary*, Major W. Grant, Drumbuie, Glenurquhart. 2 Medals. 1892.

*Kirkcudbrightshire.*

20. DALRY.—*Convener*, Oliphant Brown, Dalry, Galloway; *Secretary*, D. Cumming, Dalry, Galloway. 2 Medals. 1892.

*Lanarkshire.*

21. CARMUNNOCK.—*Convener and Secretary*, William Fleming, Windlaw, Carmunnock. 2 Medals. 1883. (In abeyance in 1885, 1886, 1887, 1888, and 1889.)
22. LANARKSHIRE.—*Convener*, John Clark Forrest, Banker, Hamilton; *Secretary*, James Cassels, Union Bank, Hamilton. 2 Medals. 1892.
23. LESMAHAGOW.—*Convener*, Gavin Hamilton of Auldtown, Lesmahagow; *Secretary*, Gavin Hamilton, jun., British Linen Co. Bank, Lesmahagow. 2 Medals. 1891.
24. SHOTTS, CALDERWATERHEAD.—*Convener*, Peter Forrest of Hairmyres, Shotts; *Secretary*, Thomas Loudoun, Muirhouse, Holytown. 2 Medals. 1892.

*Linlithgowshire.*

25. WEST LOTHIAN.—*Convener*, George F. Melville, Lochcote, Linlithgow; *Secretary*, Wm. Meikle, East Bonhard, Linlithgow. 2 Medals. 1891.

*Perthshire.*

26. STRATHEARN.—*Convener*, Colonel D. R. Williamson of Lawers, Crieff; *Secretary*, A. Anderson Connon, Solicitor, Crieff. 2 Medals. 1891.

*Renfrewshire.*

27. KILMALCOLM AND PORT-GLASGOW.—*Convener*, Alex. Love, Margaret's Mill, Kilmalcolm; *Secretary*, John Scott, Meadowbank, Kilmalcolm. 2 Medals. 1891.
28. LOWER WARD OF RENFREWSHIRE.—*Convener*, R. Sinclair Scott, Craigievar, Skelmorlie; *Secretary*, J. W. Crawford, Greenock. 2 Medals. 1891.

Applications from other Districts must be lodged with the Secretary of the Society by 1st November next.

## RULES OF COMPETITION.

1. All Competitions must be at the instance of a local Society.
2. The classes for which Medals are granted must be in accordance with the list at pages 54 and 55. The Committee shall select the classes, and specify them in the return.
3. In each District the Convener (who must be a member of the Society appointed by the Directors) shall fix the time and place of Competition, appoint the Judges, and make all other necessary arrangements, in concurrence with the other members of the Society, and the local Association of the District.
4. The Money Premiums given in the District must be £2 for each Medal claimed.
5. The Medal for Sheep-Shearing shall not be awarded unless there are three competitors, and it shall always accompany the highest Money Premium. There must not be fewer than two competitors in all the classes.
6. Blank reports will be furnished to all the Conveners and Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st of November next*, with the exception of green crop reports, which must be forwarded on or before the 20th of December, for the approval of the Directors, against whose decisions there shall be no appeal.
7. When a grant has expired, the District cannot apply again for aid for two years, and if no competition takes place in a District for two years the grant expires.

## PLOUGHING COMPETITIONS.

The Minor Silver Medal will be given to the winner of the first or highest Premium at Ploughing Competitions, provided a Report in the following terms is made to the Secretary, within one month of the Competition, by a Member of the Society:—



## FORM OF REPORT.

I, \_\_\_\_\_ of \_\_\_\_\_ Member of the Highland and Agricultural Society, hereby certify that I attended the Ploughing Match of the \_\_\_\_\_ Association at \_\_\_\_\_ in the county of \_\_\_\_\_ on the \_\_\_\_\_ when \_\_\_\_\_ ploughs competed ; \_\_\_\_\_ of land were assigned to each, and \_\_\_\_\_ hours were allowed for the execution of the work. The sum of £ \_\_\_\_\_ was awarded in the following proportions, viz. :—

[*Here enumerate the names and designations of successful Competitors.*]

## RULES OF COMPETITION.

1. All Matches must be at the instance of a local Society or Ploughing Association, and no Match at the instance of an individual, or confined to the tenants of one estate, will be recognised.

2. The title of such Society or Association, together with the name and address of the Secretary, must be registered with the Secretary of the Highland and Agricultural Society, 3 George IV. Bridge, Edinburgh.

3. Not more than one Match in the same season can take place within the bounds of the same Society or Association.

4. All reports must be lodged within one month of the date of the Match, and certified by a Member of the Highland and Agricultural Society who was present at it.

5. A Member can only report one Match, and a Ploughman cannot carry more than three Medals in the same season.

6. To warrant the grant of the Medal there must have been twelve ploughs in Competition, and Three Pounds awarded in Premiums by the local Society. The Medal to be given to the winner of the first or highest prize.

7. Ploughmen shall not be allowed any assistance, and their work must not be set up nor touched by others ; on land of average tenacity the ploughing should be at the rate of an imperial acre in ten hours, and attention should be given to the firmness and sufficiency of the work below more than to its neatness above the surface.

## CLASS III.

## COTTAGES AND GARDENS.

The following Premiums are offered for Competition in the Parishes after mentioned.

The Premiums are granted for two years.

## PREMIUMS FOR BEST KEPT COTTAGES AND GARDENS.

1. Best kept Cottage	.	.	.	.	.	£1	0	0		
Second best	.	.	.	.	.		0	10	0	
2. Best kept Cottage Garden	.	.	.	.	.		1	0	0	
Second best	.	.	.	.	.			0	10	0

*Fifeshire.*

1. KINGSKITTLE.—*Convener*, William Dingwall, Ramornie, Ladybank ;  
*Secretary*, Thomas Blyth, Gas Works, Kettle. Granted 1891.

## RULES OF COMPETITION.

1. Competitions may take place in the different parishes for Cottages and Gardens, or for either separately.

2. The occupiers of Lodges at Gentlemen's Approach Gates and Gardeners' Houses are excluded, as well as others whom the Committee consider, from their position, not to be entitled to compete. The inspection must be completed by the 1st of October. In making the inspection, the Conveners may take the assistance of any competent judges.

3. It is left to the Committee of the District to regulate the maximum annual rent of the Cottages, which may, with the garden, be from £5 to £7.

4. To warrant the award of full Premiums, there must not be fewer than three competitors in each class. If there are less than three competitors in each class, only half Premium will be awarded.

5. A person who has gained the highest Premium cannot compete again.

6. If the Cottage is occupied by the proprietor, the roof must be in good repair; if the roof is thatch, it must be in good repair, though in the occupation of a tenant. The interior and external conveniences must be clean and orderly—the windows must be free of broken glass, clean, and affording the means of ventilation. Dunghills, and all other nuisances, must be removed from the front and gables. In awarding the Cottage Premiums, preference will be given to Competitors who, in addition to the above requisites, have displayed the greatest taste in ornamenting the exterior of their houses, and the ground in front and at the gables.

7. In estimating the claims for the Garden Premiums, the judges should have in view—The sufficiency and neatness of the fences and walks; the cleanness of the ground; the quality and choice of the crops; and the general productiveness of the garden.

8. Reports, stating the number of Competitors, the names of successful parties, and the nature of the exertions which have been made by them, must be transmitted by the Conveners to the Secretary *on or before the 1st November next*.

9. When a grant has expired, the District cannot apply again for aid for two years.

Parishes desirous of these Premiums must lodge applications with the Secretary *on or before the 1st November next*.

## MEDALS FOR COTTAGES AND GARDENS OR GARDEN PRODUCE.

The Society will issue annually two Minor Silver Medals to a limited number of local Associations or individuals, who at their own expense establish Premiums for Cottages or Gardens under £15 of Rent. The Medals may be awarded for best kept Cottage, and best kept Garden or Flower Plot, or Garden Produce.

Local Associations or individuals desirous of these Medals, must lodge applications with the Secretary *on or before the 1st November next*.

The Medals are granted for two years.

*Aberdeenshire.*

1. DYCE AND PARKHILL.—*Convener*, A. F. Nares, The Cottage, Parkhill, Aberdeen; *Secretary*, John Lang, Mill of Dyce, Dyce. 2 Medals. 1892.

2. KINELLAR.—*Convener*, ; *Secretary*, Neil Smith, Blackburn, Kinaldie. Granted 1891.

*Ayrshire.*

3. GALSTON.—*Convener*, J. H. Turner, Portland Estates Office, Kilmarnock ; *Secretary*, Abram Yendall, jun., 20 Barr Street, Galston. 2 Medals. 1892.

*Dumbartonshire.*

4. OLD KILPATRICK.—*Convener*, William Stewart, Milton Farm, Duntocher ; *Secretary*, Donald Stewart, Parkhill, Dalmuir. Granted 1891.

*Fifehire.*

5. KIRKCALDY.—*Convener*, George Prentice of Strathore, Thornton ; *Secretary*, John Leslie, 293 Links Street, Kirkcaldy. Granted 1891.
6. NEWBURGH.—*Convener*, Geo. Dun, Ormiston, Newburgh ; *Secretary*, Angus Cameron, Craigview, Newburgh. Granted 1890. (In abeyance in 1890 and 1891.)

*Haddingtonshire.*

7. EAST LOTHIAN.—*Convener*, The Master of Polwarth, Humble House, Upper Keith ; *Secretary*, George Badger, Haddington. 2 Medals. 1892.

*Inverness-shire.*

8. CROY.—*Convener*, Duncan Forbes of Culloden, Inverness ; *Secretary*, James Wedderspoon, Schoolhouse, Croy, Fort-George Station. 2 Medals. 1892.
9. ERCHLESS.—*Convener*, J. B. Grant, Erchless, Beaully ; *Secretary*, A. Macintosh, Erchless, Beaully. Granted 1891.

*Stewartry of Kirkcudbright.*

10. CRIFFEL.—*Convener*, Mark J. Stewart of Southwick, M.P., Dumfries ; *Secretary*, W. A. Forsyth, Preston Schoolhouse, Preston Mill, Dumfries. 2 Medals. 1892.

*Lanarkshire.*

11. CAMBUSLANG.—*Convener*, John Speir, Newton Farm, Newton, Cambuslang ; *Secretary*, James M. Aitchison, Rosebank Buildings, Cambuslang. 2 Medals. 1891.
12. CARNWATH.—*Convener*, George Russell, Carnwath ; *Secretary*, David Aitken, Carnwath. 2 Medals. 1892.

*Nairnshire.*

13. CAWDOR.—*Convener*, R. Fraser, Brackla, Nairn ; *Secretary*, George Mill, Piperhill, Nairn. 2 Medals. 1892.

*Perthshire.*

14. BLAIRGOWRIE AND RATTRAY.—*Convener*, John Anderson, Castlehill, Rattray ; *Secretary*, Henry Dryerre, 10 High Street, Blairgowrie. Granted 1891.
15. BRIDGE OF EARN.—*Convener*, Sir Robert D. Moncreiffe of Moncreiffe, Bart., Bridge of Earn ; *Secretary*, John Ellis, The Schoolhouse, Bridge of Earn. Granted 1891.

16. CHERRYBANK.—*Convener*, W. S. Ferguson, Pictstonhill, Perth; *Secretary*, R. H. Meldrum, Cherrybank, Perth. 2 Medals. 1892.

*Renfrewshire.*

17. HOUSTON.—*Convener*, William Fleming, Fulwood Mains, Linwood; *Secretary*, William King, Church Road, Houston. Granted 1891.

*Stirlingshire.*

18. KILLEARN.—*Convener*, David Wilson, jun., of Carbeth, Killearn; *Secretary*, James Thomson, Killearn. 2 Medals. 1892.

19. MILTON OF CAMPSIE.—*Convener*, C. M. King, Antermoney House, Milton of Campsie; *Secretary*, R. L. Fulton, Milton of Campsie. 2 Medals. 1892.

*Wigtownshire.*

20. INCH.—*Convener*, The Earl of Stair, K.T., Loch Inch, Castle Kennedy; *Secretary*, Thomas C. Greig, Rephad, Stranraer. Granted 1891.

21. NEWTON-STEWART HORTICULTURAL.—*Convener*, A. B. Matthews, Newton-Stewart; *Secretary*, W. M. Kelly, Solicitor, Newton-Stewart. 2 Medals. 1890. (In abeyance in 1890.)

REGULATIONS.

1. Competitions may take place in the different districts for Cottages and Gardens, or for either separately.

2. The annual value of each Cottage, with the ground occupied in the parish by a Competitor, must not exceed £15.

3. If Competition takes place for Garden Produce in place of the best kept Garden, such produce must be *bona fide* grown in the Exhibitor's Garden, and he will not be allowed to make up a collection from any other Garden.

4. To warrant the award of the Medals, there must not be fewer than three Competitors.

5. Blank reports will be furnished to the Conveners and Secretaries of the different Districts. These must, in all details, be completed and lodged with the Secretary *on or before the 1st November next*, for the approval of the Directors, against whose decisions there shall be no appeal.

6. When a grant has expired, the District cannot apply again for aid for two years, and if no competition takes place in a District for two years the grant expires.

IMPROVING EXISTING COTTAGES.

To the Proprietor in Scotland who shall report the Improvement of the greatest number of Cottages during the years 1889, 1890, and 1891—The Gold Medal.

BUILDING NEW COTTAGES.

To the Proprietor in Scotland who shall report the Erection of the greatest number of approved Cottages during the years 1888, 1889, 1890, and 1891—The Gold Medal.

RULES OF COMPETITION.

1. Claims for the Premiums must be lodged with the Secretary on or before the 1st of October next, to allow an inspection to be made of the

different Cottages. The inspection will be conducted by a Committee of the Society's Members, and Reports must be transmitted to the Secretary *on or before the 1st November next.*

2. The annual value of the Cottage or Cottages separately, with the garden ground, must not exceed £5.

3. In estimating the claims of the Competitors, the following points will be kept in view: The external appearance of the Cottages; their internal accommodation; the arrangements of the out-houses; the means of drainage and ventilation; and the expense of the building or of the alteration, compared with its durability and accommodation. When the Cottages of one Competitor are superior in style and comfort to those of another, though not so numerous, the Inspectors will give them preference, provided they amount at least to three, and have been erected at a moderate expense.

4. Parties competing will forward to the Society Plans, Specifications, and Estimates, of which, and of all information sent therewith, copies may be taken for publication, if the Society shall see fit, and the originals returned to the parties within six months, if desired.

# HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

---

## GENERAL SHOW OF STOCK AND IMPLEMENTS

AT

## INVERNESS,

ON 26TH, 27TH, 28TH, AND 29TH JULY 1892.

---

### LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 23d May.

STOCK, POULTRY, AND DAIRY PRODUCE—Monday, 20th June.

No Entry taken later than by first post, or 10 o'clock, on Monday morning (20th June). Post Entries for Stock only taken at double fees till Wednesday morning (22d June) at 10 o'clock.

COVERED BOOTHS FOR OFFICES—Monday, 20th June.

---

### President of the Society.

SIR GEORGE MACPHERSON GRANT of Ballindalloch, Bart.

### Chairman of the Local Committee.

DUNCAN FORBES, Esq. of Culloden, Inverness.

---

The District connected with the Show comprises the Counties of Inverness, Elgin, Nairn, Ross and Cromarty, Caithness, Sutherland, and Orkney, including Shetland.

---

## REGULATIONS.

---

### GENERAL CONDITIONS.

1. The Competition is open to Exhibitors from all parts of the United Kingdom.

2. Every Lot must be intimated by a Certificate of Entry, lodged with the Secretary *not later than Monday, 23d May, for Implements and other Articles, and Monday, 20th June, for Stock, Poultry, and Dairy Produce.* No Entry taken later than by first post, or 10 o'clock, on Monday morning, 20th June. Post Entries for Stock only taken at double fees till Wednesday morning (22d June) at 10 o'clock. Printed forms of Entry will be issued on application to the Secretary, No. 3 George IV. Bridge, Edinburgh. Admission Orders will be forwarded to Exhibitors, by Post, previous to the Show.

3. Protests against the awards of the Judges, or against a violation of

the judging regulations, must be lodged with the Secretary not later than 9 A.M. on Wednesday, 27th July, and parties must be in attendance at the Committee Room, in the Showyard, at 9.30 A.M. that day, when protests will be disposed of. All protests must be accompanied by the deposit of £2, 2s., and if not sustained the sum will be forfeited at the discretion of the Directors.

4. Protests lodged for causes which the protester produces no good evidence to substantiate, will render him liable to be reported to the Board of Directors, with the view, if they see reason, of his being prohibited from again entering Stock for a General Show.

5. The Society shall not be liable for any loss or damage which Stock, Poultry, Dairy Produce, Implements, or other articles may sustain at the Show, or in transit.

6. The decisions of the Board of Directors are final in all questions respecting Premiums and all other matters connected with the Show, and it shall not be competent for any Exhibitor to appeal against such decisions to, nor seek redress in respect of them from, any other tribunal.

7. Covered Booths for Offices (9 feet by 9 feet), purely for business, not for exhibition of goods, can be had for £3, 10s. to Members and £5 to Non-Members. Intimation to be made to the Secretary on or before the 20th of June. Those applying after that date to pay double Entry Money, but no application can be received later than 8th July.

8. No lights allowed in the Yard at night, and Smoking is strictly prohibited within the Sheds. Those infringing this Rule will be fined 10s.

9. As the command of water in the Yard is limited, it is particularly requested that waste be avoided.

10. When the ground requires to be broken, the turf must be carefully lifted and laid aside, and the surface must be restored to the satisfaction of the Society, and at the expense of the Exhibitor.

11. All persons admitted into the Showyard shall be subject to the Rules and Orders of the Directors.

12. The Stewards have power to enforce the Regulations of the Society in their different departments, and to bring to the notice of the Directors any infringement thereof.

13. All persons in charge of Stock or other Exhibits shall be subject to the orders of the Stewards.

14. The violation by an Exhibitor of any one of the Regulations will involve the forfeiture of all Premiums awarded to him, or of such a portion as the Directors may ordain.

15. Railway Passes for unsold Stock and Implements must be applied for at the Committee Room in the Yard between 9 and 11 o'clock on the forenoon of Thursday and Friday.

16. The Show terminates at 5 P.M. on Friday, 29th July, and no animal or article can be withdrawn before that hour. Steam Engines not till 6 o'clock. Stock and Implements may remain in the Yard till Saturday afternoon.

17. The Premiums awarded will be paid in November 1892, and, with the exception of the Tweeddale Gold Medal, Special Challenge Cups, and the Silver Medals, may be taken either in money or in plate.

## STOCK AND POULTRY.

18. Poultry and Stock will be admitted on Monday, 25th July, and, with the exception of Horses, must be in the Yard before 12 o'clock that night. Horses must be in before 8 o'clock on the morning of Tuesday, except those entered for Jumping only, which do not require to be in till Wednesday morning before 8 o'clock. Judging to commence at 10 A.M. on Tuesday, 26th July. Exhibited on Tuesday, Wednesday, Thursday,

and Friday, 26th, 27th, 28th, and 29th July. Stock may be admitted on Saturday the 23d July, but only by sending information to the Secretary before the 21st July.

19. An animal which has gained a first Premium at a General Show of the Society cannot again compete in the same section, but may be exhibited as Extra Stock.

20. All animals, except calves, foals, and lambs shown with their dams, must be entered in the sections applicable to their ages, and cannot be withdrawn after entry, or other animals be substituted in their place.

21. No animal to be allowed to compete in more than one section, except for Jumping.

22. Shorthorn, Aberdeen-Angus, and Galloway animals must be entered in the herd-books, or the Exhibitor must produce evidence that his animal is eligible to be entered therein.

23. Stock must be *bona fide* the property and in the possession of the Exhibitor on the last day of Entry.

24. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor.

25. The name of the Breeder, if known, must be given, and if the Breeder is not known, a declaration to that effect, signed by the Exhibitor, must be sent along with the Schedule, and no pedigree will be entered in the Catalogue when the Breeder is unknown.

26. Should it be proved to the satisfaction of the Directors that an animal has been entered under a false name, pedigree, or description, for the purpose of misleading the Directors or Judges as to its qualification or properties, or that information required in the Schedule and known or easily ascertained by the Exhibitor has been withheld, such animal may be disqualified either before or after a prize has been awarded to it, and the case may be reported to the first Meeting of Directors, in order that the Exhibitor may be disqualified from again competing at the Society's Shows, or his case otherwise disposed of as the Directors may determine.

27. When an animal has previously been disqualified by the decision of any Agricultural Association in the United Kingdom, such disqualification shall attach, if the Exhibitor, being aware of the disqualification, fail to state it, and the grounds thereof, in his entry, to enable the Directors to judge of its validity. Any person who is disqualified from exhibiting at any Show in the United Kingdom, shall be prohibited from exhibiting at any General Show of the Society unless with the special consent of the Board.

28. Breeding Stock must not be shown in an improper state of fatness, and the Judges are requested not to award Premiums to overfed animals; and no Cattle or Sheep which have been exhibited as Fat Stock at any Show are eligible to compete in the Breeding Sections for the Society's Prizes.

29. Horses and Cattle must be paraded when required by the Stewards, and under their direction; and the prize and commended animals will receive two Rosettes, which must be attached to the head of the animal, one on each side.

30. Exhibitors shall be answerable for all acts, whether committed by themselves, their servants, or others in charge of their Stock, and shall be responsible for the condition of their animals during the whole time they remain in the Showyard.

31. No animal to be taken out of its stall after 10 A.M. during the Show except by order of the Stewards, or with permission of the Secretary. Those infringing this Rule will be fined 10s.

32. Aged Bulls and Stallions must have had produce, and, along with Two-year-old Bulls, Three-year-old Colts, and aged Tups, have served within the year of the Show.

33. All Cows must have had calves previous to the Show, and when ex-



hibited they must either be in milk or in calf: if in milk, birth must have been within 9 months of the Show; if in calf, birth must be certified within 9 months after the Show. This Rule does not apply to animals in Family Groups.

34. Cows in the Family Groups must have had calves previous to the Show, and when exhibited they must be either in milk or in calf. Two-year-old Heifers in the Family Group Prizes to be certified to have been served before the Show, except Highland Heifers, which need not be served till 3 years old.

35. All Milk Cows of the Ayrshire breed must be in the Yard on the evening of Monday, 25th July, before 8 o'clock, after which they will be inspected by the Veterinary Surgeon, or other official of the Society, between 8 and 9 o'clock, to see if they have been milked dry; and if not, they must be milked under his direction, and, after the judging, all Milk Cows must be milked morning and evening.

36. Any artificial contrivance or device of any description found on or proved to have been used on an animal, either for preventing the flow of milk or for any other improper purpose, will disqualify that animal from being awarded a Premium, and the Owner of said animal will be prohibited from again entering Stock for any of the Society's General Shows, or for such a period as the Directors may see fit.

37. Two-year-old Heifers—of the Shorthorn, Aberdeen-Angus, and Gallo-way breeds—must be in calf when exhibited, and the Premiums will be withheld till birth be certified, which must be within 9 months after the Show. This Rule does not apply to animals in the Family Groups.

38. Animals of any age that have had a calf must be shown as Cows.

39. Mares in Section 5 must have produced foals after 1st January 1892, and foals must be at foot. In the case of a Mare whose foal has died, she shall without further entry be eligible to compete among the Yeld Mares. Mares in Section 6 must be in foal, and awards will be suspended till birth is certified, which must be within 11 months from the date of the Show.

40. With reference to Regulations 33 and 37, birth of at least a seven months' calf must be certified; and in regard to Regulation 39, birth of at least a nine months' foal.

41. No rug shall be hung up so as to conceal any animal in a horse-box or stall, except with special permission of the Steward of that department.

42. Horses entered as Hunters must be tried over the leaping-bar if required by the Judges.

43. Judges are particularly requested to satisfy themselves, as far as possible, regarding the soundness of all Horses before awarding the Prizes, and to avoid giving a preference to animals showing symptoms of hereditary diseases. The Judges may consult the Society's Veterinary Surgeon if they deem it expedient. No protests on veterinary grounds will be received.

44. All Ewes must have reared lambs in 1892; and Ewes of the Black-faced and Cheviot breeds must be in milk, and have their lambs at foot.

45. Sheep must have been clipt bare after 1st January 1892, and the Judges are instructed to examine the fleeces of the Sheep selected for Prizes, and to cast those on which they find any of the former fleece.

46. Sows must have reared pigs in 1892 or be in pig; and Pigs must belong to the same litter, and be uncut.

47. In Poultry the Aged Birds must have been hatched previous to, and Cockerels and Pullets in, 1892.

48. Bulls must be secured by nose-rings, with chains or ropes attached, or with strong halters and double ropes. All Cattle must be tied in their stalls.

49. Servants in charge of Stock must bring their own buckets or pails, and a piece of rope or sheep-net to carry their forage. Mangers, sheep and pig troughs, will be provided.

50. Loose-boxes will be provided for Stallions, Three, Two, and One

year-old entire Colts, and for Mares with foals at foot; closed-in stables for all the other Horses, and covered accommodation for the whole of the other Stock.

51. Straw, hay, grass, and tares will be provided free by the Society during the four days of the Show. Animals in the Yard all Monday to get full rations; those arriving after 12 o'clock noon half rations; other kinds of food will be supplied at fixed prices in the Forage-yard. Any servant removing bedding from an adjoining stall will be fined in double the amount taken. Exhibitors may fetch their own cake or corn to the Yard, but not grass, tares, hay, nor straw. Coops, food, and attendance for Poultry will be found by the Society.

52. Cattle, Sheep, Swine, or Poultry cannot be removed from the Yard till 5 P.M. on Friday, 29th July, except on certificate by the Veterinary Surgeon employed by the Directors, countersigned by the Steward of the department and the Secretary.

53. Horses may be withdrawn at 6 o'clock each evening on a deposit of £5 for each animal, which shall be forfeited, along with any prize money it may have gained, if the animal is not brought back. They must return between 7 and 7.30 the following morning, and those not in before 8 will forfeit 10s. Horse passes to be applied for at the Committee Room between 5 and 6 P.M. on Tuesday, and the deposit will be returned between 12.30 and 2.30 on Friday.

54. When the Stock is leaving the Yard, no animal is to be moved till ordered by those in charge of clearing the Yard. Those transgressing this Rule will be fined 10s., and detained till all the other Stock is removed.

### JUDGING STOCK AND POULTRY.

55. On Tuesday, 26th July, no person will be admitted, except Servants in charge of Stock, till 8 A.M., when the Gates are opened to the public.

56. The Judges will commence their inspection at 10 A.M. The space reserved for the Judges will be enclosed by ropes, and no encroachment will be permitted. In no case shall a Premium be awarded unless the Judges deem the animals to have sufficient merit; and where only one or two lots are presented in a section, and the Judges consider them unworthy of the Premiums offered, it shall be in their power to award a lower prize, or to suggest the removal of any lot which appears to them unworthy of being placed in the Yard.

57. In addition to the Premiums, the Judges are authorised to award three Commendations in each section (except Poultry, where only two Prizes and one Commendation are to be awarded), if the entries are numerous and the animals of sufficient merit. These Commendations to consist of—Very Highly Commended, Highly Commended, and Commended.

58. The animals in Section 8 (Ayrshire breed) which have not calved before the Show, will be judged along with the Cows in Calf, and those in Section 9 which have calved before the Show will be judged along with Cows in Milk.

59. Two Members of Committee and a Director will attend each section of the Judges. It will be their duty to bring the animals out to the Judges and to see that no obstruction is offered to them, and that the space reserved for them is not encroached on; to ticket the prize animals to send the Nos. of prize animals to the Award Lectern; to assist the Judges in completing their reports; and should any difficulty arise, to communicate with the Stewards.

60. It shall not be competent for any Exhibitor, nor for his Factor or Land-Steward, to act as a Judge or attending Member in any class in

## DAIRY PRODUCE.

61. Butter will be received in the Showyard on Monday, 25th July, and till 8 A.M. on Tuesday, 26th July. Judged at 10 A.M. on Tuesday. Exhibited Tuesday, Wednesday, Thursday, and Friday.

62. Butter must have been made on the Exhibitor's farm in 1892. No Exhibitor to show more than one lot in each section. At least 1 cwt. of the variety of Butter exhibited must have been made during the Season. The lots must be fair samples. No lot can be removed from the Yard till 5 P.M. on Friday, 29th July.

## STALL RENT.

63. The following rates shall be paid by Exhibitors when making their Entries :—

	Members.		Non-Members.	
	s.	d.	s.	d.
Cattle, each . . . . .	15	0	25	0
Boxes for Stallions—3 and 2 year-old entire Colts, and Mares with Foals at foot . . . . .	30	0	40	0
Boxes for one-year-old entire Colts . . . . .	20	0	30	0
Stallions, 12 hands and under . . . . .	15	0	20	0
Mares or Geldings, 12 hands and under . . . . .	10	0	15	0
All other Horses, each . . . . .	20	0	30	0
Sheep, per pen . . . . .	10	0	15	0
Swine, per pen . . . . .	15	0	20	0
Poultry, each entry . . . . .	3	0	5	0
Dairy Produce, each entry . . . . .	4	0	6	0
Stalls for Attendants, same rates as above.				
Covered Booths for offices, 9 feet by 9 feet . . . . .	70	0	100	0
Newspaper offices . . . . .	£2, 10s.			

## FINE FOR STOCK NOT FORWARD.

64. In order to lessen the number of vacant Stalls, the following fines will be imposed on all Exhibitors whose animals are not forward: For Horses, 40s.; Cattle, 20s.; Sheep and Swine, 10s.; Poultry, 5s.;—this fine to be in addition to Entry Money. In the case of death or illness of an animal, a Veterinary Surgeon's Certificate is necessary for a remit of the fine. The absent animals must be reported by the Stewards to the Secretary

## EXTRA STALL FOR ATTENDANTS.

65. Exhibitors of Stock shall be entitled to take an extra Stall for the accommodation of their attendants without being liable to a fine, but they must state when making their Entry that the Stall is to be used for that purpose, and remit rent.

## IMPLEMENTS AND OTHER ARTICLES.

66. Implements will be received in the Yard on Tuesday, 19th July, and till 5 o'clock on the afternoon of Monday, 25th July. Exhibited Tuesday, Wednesday, Thursday, and Friday, 26th, 27th, 28th, and 29th July. The Schedule of Entry must be filled up so far as within the knowledge of the Exhibitor, and prices must be stated.

67. No Money Prizes or Medals will be given for Implements of any kind, and no inspection of them by Judges will take place.

68. Agricultural Implements, and Implements and collections of articles not Agricultural, will be received for Exhibition, but the Secretary is entitled to refuse Entries from dealers in articles not deemed worthy of Exhibition.

69. In order to encourage exhibits of Agricultural Implements from operative Blacksmiths and Carpenters in the district of the Show, open space will be provided for these in some less prominent part of the Yard at a charge of Entry Money of 1s. per running foot of frontage, 20 feet deep.

70. Implements will be placed in the following sections—viz., 1st, Under Cover, for Agricultural Implements; 2d, Open, for Agricultural Implements; 3d, Exhibits not Implements of Husbandry, which will be placed apart from the Agricultural Implements, either under cover or open, as may be deemed necessary by the Secretary; 4th, Motion Yard; 5th, Open space for Agricultural Implements from operative Blacksmiths and Carpenters in the district of the Show. Exhibitors must specify the space they require.

71. The articles of each Exhibitor must be all placed in one stand, except Implements in motion, and must not on any account extend beyond the width allowed. No article to be moved out of its stand, or the stand dismantled, till the termination of the Show, at 5 P.M. on Friday, 29th July. Those infringing this Rule will be fined 10s.

72. Exhibitors must arrange their own articles *within* the space allotted to them before 9 o'clock on Tuesday the 26th July, and to the satisfaction of the Stewards in charge of the Implement Yard.

73. All Machines requiring steam or fire must be entered as such in the Certificate; and will be placed in the Motion Yard. *Coke only to be used in all cases where fire is required after 10 o'clock A.M.* Those infringing this Rule will incur a penalty of £5.

74. No Steam Engine shall be driven in the Yard at a greater speed than 4 miles an hour.

75. Locomotive and Traction Engines and other Machines must not be moved from their places without permission of the Stewards, and must not leave their stands till 6 P.M. on Friday.

76. There must be attached to each Implement, when forwarded to the Show, a label bearing the Exhibitor's name, and that of the Implement.

77. The carriage of all Implements must be prepaid.

#### STALL RENT.

78. Ground to be taken in spaces of 10 feet frontage by 20 feet deep, except in Motion Yard, which is to be 10 feet or any larger amount of frontage by 50 feet deep. Except for exhibits not agricultural, no boarding shall exceed 4 feet in height.

79. The following rates shall be paid by Exhibitors when making their Entries:—

	Members.	Non-Members.
Implement Shedding, 20 feet deep, 7 feet high, per 10 feet . . . . .	£1 5 0	£1 15 0
Implements without Shedding, 20 feet deep, per 10 feet . . . . .	1 5 0	1 15 0
Implement space in Motion Yard, without Shedding, 50 feet deep, per foot . . . . .	0 2 6	0 3 6
And with Shedding, 20 feet deep, 10 feet high, per foot . . . . .	0 6 0	0 8 0
Covered Booths for offices, 9 feet by 9 feet each	3 10 0	5 0 0
Newspaper offices, each . . . . .	£2, 10s.	

## ADMISSION TO YARD.

The Public will be admitted on Tuesday, 26th July, at 8 A.M. The inspection by the Judges commences at 10 A.M. The charges will be—Tuesday, from 8 A.M. till 5 P.M., 5s.; Wednesday, from 8 A.M. till 5 P.M., 3s.; Thursday, from 8 A.M. till 5 P.M., 1s.; Friday, from 8 A.M. till 5 P.M., 1s.

Members of the Society are admitted to the Showyard without payment, on exhibiting a "*Member's Ticket*," which is strictly not transferable. Tickets will be sent to all members residing in the United Kingdom whose addresses are known, and on no account will duplicates be issued. All Members not producing their tickets must pay at the gate, and the admission money will not be returned.

Exhibitors of Stock (not Members) are admitted free on producing their tickets.

Exhibitors of Implements (not Members) and their attendants will be entitled to free entry during the Show, but must remain at their stalls during the judging of the Stock on Tuesday.

Tickets for attendants on Stock and Implements are not available to admit to the Yard between 11 A.M. and 5 P.M.; and any attendant requiring to leave the Yard during the day cannot be again admitted except by a special pass (to be applied for at the Ticket Gate), which must be given up on his return.

Placards, except those of the Society, are prohibited both inside the Showyard and on the outside of the Boundary Fence, with the exception of those belonging to Exhibitors, whose right is confined to their own stalls. No newspapers or any other article allowed to be carried about the Yard for sale or display. No strolling bands or musicians admitted.

*No Carriages or Equestrians admitted without special leave from the Directors, and then only for Invalids. Bath-chairs may be brought in.*

Premium Lists, Regulations, and Certificates of Entry may be obtained by applying at the Secretary's Office, No. 3 George IV. Bridge, Edinburgh.

*All Communications should be addressed to FLETCHER NORTON MENZIES, Esq., Secretary of the Highland and Agricultural Society of Scotland, No. 3 George IV. Bridge, Edinburgh.*

## LAST DAYS OF ENTRY.

IMPLEMENTS AND OTHER ARTICLES—Monday, 23d May.  
STOCK, POULTRY, AND DAIRY PRODUCE—Monday, 20th June.

No Entry taken later than by first post, or 10 o'clock, on Monday morning (20th June). Post Entries for Stock only taken at double fees till Wednesday morning (22d June) at 10 o'clock.

COVERED BOOTHS FOR OFFICES—Monday, 20th June.

## RAILWAY ARRANGEMENTS.

The Railway Companies will be furnished with a list of the Exhibitors of Stock and Implements, after the 6th of July, and all applications for horse-boxes and trucks, and for information as to arrangements of Special Trains, must be made by the Exhibitors themselves with the Station-master where their stock is to be trucked.

The Railway Companies have adopted the following Regulations :—

STOCK AND EXHIBITS TO AND FROM AGRICULTURAL SOCIETIES' ANNUAL SHOWS, THE SMITHFIELD CLUB CATTLE SHOW, AND THE BRITISH FARMERS' DAIRY SHOW.

*Live Stock.*

1. Live Stock to the Show to be charged ordinary rates.
2. Live Stock from the Show, if sold, to be charged ordinary rates.
3. Live Stock from the Show, if unsold, to be conveyed at half rates back to the station whence they were sent, at owners' risk, on production of a certificate from the Secretary of the Agricultural Show to the effect that they are really unsold ; failing production of such certificate, ordinary rates must be charged. The reduction to half rate is to be allowed only when the animals are returned by the same route as that by which they were conveyed to the Show. Minimum charge for Stock returned at half rates to be one-half the ordinary minimum.

*If the unsold Live Stock which was conveyed on the outward journey by Passenger Train in horse-boxes be required to be returned by Goods Train in cattle trucks, half the Goods Train rates must be charged.*

4. Live Stock rates are "station to station" only.
5. Unsold Live Stock transferred from one Agricultural Show to another, in another part of the country, must be charged ordinary rates.
6. Poultry to be charged ordinary rates both ways.
7. Horse-boxes must not be provided for the carriage of Live Stock sent by Goods Train and invoiced at Goods Train rates.
8. Provender conveyed to Agricultural Shows with Live Stock is to be charged ordinary rates, except so much of the same as may be required on the journey.
9. Men, certified by the owners to be *bona fide* in charge of Live Stock, to be conveyed free in the same train as the animals ; the number not to exceed one man to each vehicle.

NOTE.—*Upon both the outward and homeward journey a separate certificate must be given (upon the proper Form), which must be retained by the station-master at the outward or homeward starting-point, as the case may be.*

10. For men in charge of Live Stock forwarded by Goods Train, no separate pass must be issued, but the form of pass must be printed upon the Live Stock Ticket, which must be delivered up on the arrival of the Live Stock at their destination.

NOTE.—*Regulations Nos. 1-10 as above apply also to Live Stock to and from all fixed periodical Horse and Cattle Shows where the animals are sent to compete for prizes.*

*Agricultural Machines, Implements, and other Exhibits.*

11. Agricultural Machines, Implements, and other Exhibits to the Show to be charged ordinary rates.

12. Agricultural Machines, Implements, and other Exhibits *from* the Show, *if sold*, to be charged ordinary rates.

13. Agricultural Machines, Implements, and other Exhibits *from* the Show, *if unsold*, to be conveyed at half rates back to the station whence they were sent, at owners' risk, on production of a certificate from the Secretary of the Agricultural Show to the effect that they are really unsold; failing production of such certificate, ordinary rates must be charged. The reduction to half rate is to be allowed only when the articles are returned by the same route as that by which they were conveyed *to* the Show.

14. The ordinary rates do not include delivery *to*, or collection *from*, the Show Ground.

15. Unsold goods transferred from one Agricultural Show to another, in another part of the country, must be charged ordinary rates.

16. Agricultural Societies' Show Plant must be charged at Special Class rates, station to station.

*Tents, Canvas, &c.*

17. Tents, Canvas, and other articles carried to Agricultural Shows, not for exhibition or sale, to be charged the usual rates both going and returning.

## PREMIUMS.

In addition to the Premiums, the Judges are authorised to award three Commendations in each Section (except Poultry, where only two Prizes and one Commendation are to be awarded), if the Entries are numerous and the animals of sufficient merit. These Commendations to consist of—Very Highly Commended, Highly Commended, and Commended.

The Directors are willing to accept suitable Champion Cups or Prizes, of not less than £10 in value, for the recognised Breeds of Cattle, Horses, and Sheep, &c. Intimation to be made to the Secretary on or before 1st April.

### CLASS I.—CATTLE.

Section	SHORTHORN.	Premiums.		
		1st.	2d.	3d.
		£	£	£
1.	Bull calved before 1st Jan. 1890 . . .	15	10	5
2.	Bull calved on or after 1st Jan. 1890 . . .	15	10	5
3.	Bull calved on or after 1st Jan. 1891 . . .	12	8	4
	<sup>1</sup> Best Bull of any age in the three Sections, £10.			
	Breeder of Best Bull of any age in the three Sections,—The Silver Medal.			
4.	Cow of any age . . . . .	12	8	4
	<sup>2</sup> Best Cow of any age, £10.			
5.	Heifer calved on or after 1st Jan. 1890 . . .	10	5	3
6.	Heifer calved on or after 1st Jan. 1891 . . .	10	5	3
	Carry forward . . . . .	£144		

#### ABERDEEN-ANGUS.

<sup>3</sup> Two Silver Cups, each of the value of £50, for the best Bull of any age and for the best Cow of any age (Heifers excluded) in the Aberdeen-Angus cattle classes. These are to be Challenge Cups, and are to be known as the "Ballindalloch Challenge Cups." They are offered under the following conditions: 1. The Directors shall assume charge of the Cups, and shall frame such rules for their safety as they may decide upon. 2. Each Cup shall be held by the winner for one year as a Challenge Cup, and shall become the property of the exhibitor who shall win it five times, not necessarily in succession. 3. The Society shall, at their own expense, cause to be engraved on each Cup each year, the year, the place of the Show, name of successful exhibitor, name and herd-book number of the animal, and name of its breeder. 4. The Society shall award to the breeder of the successful animals a Silver Medal, bearing that he is the breeder of the winner of the "Ballindalloch Challenge Cup." 5. In every other respect the Cups shall be won according to regulations which the Directors may from time to time enact.

<sup>1</sup> Given by Mr Inglis of Newmore.

<sup>2</sup> Given by Major Lyon Mackenzie of Braelangwell, and other Shorthorn Breeders.

<sup>3</sup> Given by Mr Macpherson Grant of Drumduan.



Brought forward		...	...	£144
		Premiums.		
		1st.	2d.	3d.
		£	£	£
ABERDEEN-ANGUS— <i>continued.</i>				
Section				
7.	Bull calved before 1st Dec. 1889 . . .	15	10	5
8.	Bull calved on or after 1st Dec. 1889 . . .	15	10	5
9.	Bull calved on or after 1st Dec. 1890 . . .	12	8	4
	Champion Cup, value £50, for the best Bull of any age in the three Sections (see p. 11).			
	Breeder of best Bull of any age in the three Sections,—The Silver Medal.			
10.	Cow calved before 1st Dec. 1888 . . .	12	8	4
11. <sup>1</sup>	Cow three years old, £12, £8, £4.			
	Champion Cup, value £50, for the best Cow of any age in the two Sections (see p. 73).			
	Breeder of best Cow of any age in the two Sections,—The Silver Medal.			
12.	Heifer calved on or after 1st Dec. 1889 . . .	10	5	3
13.	Heifer calved on or after 1st Dec. 1890 . . .	10	5	3
	<sup>2</sup> A Champion Prize of £10, 10s. to the breeder of the best Aberdeen-Angus female, of any age, exhibited in the Showyard.	—————		
				144
GALLOWAY.				
14.	Bull of any age . . .	15	10	5
	Breeder of best Bull,—The Silver Medal.			
15.	Cow of any age . . .	10	7	3
16.	Heifer calved on or after 1st Jan. 1890 . . .	10	7	3
17.	Heifer calved on or after 1st Jan. 1891 . . .	10	7	3
		—————		
				90
HIGHLAND.				
18.	Bull calved before 1st Jan. 1890 . . .	15	10	5
19.	Bull calved on or after 1st Jan. 1890 . . .	15	10	5
20.	Bull calved on or after 1st Jan. 1891 . . .	12	8	4
	Breeder of best Bull of any age in the three Sections,—The Silver Medal.			
	<sup>3</sup> Best Bull in the three Sections, entered in the Highland Herd-Book,—Cup, value £10.			
21.	Cow of any age . . .	12	8	4
22.	Heifer calved on or after 1st Jan. 1889 . . .	10	5	3
23.	Heifer calved on or after 1st Jan. 1890 . . .	10	5	3
	<sup>4</sup> Best Female Animal in the three Sections, £10.	—————		
				144
Carry forward		...	...	£522

<sup>1</sup> Given by Mr Macpherson Grant of Drumduan.<sup>2</sup> Given by Mrs Morison Duncan of Naughton, in memory of her late father, Major Forbes Mackenzie, who was the sole exhibitor of an Aberdeen Polled Cow when the Highland Society paid its first visit to Inverness in September 1831.<sup>3</sup> Given by the Highland Herd-Book Society.<sup>4</sup> Given by Mr Malcolm of Poltalloch.

Brought forward		... ..	£522	
		Premiums.		
HIGHLAND— <i>contd.</i>		1st.	2d.	3d.
Section		£	£	£
24.	<sup>1</sup> Best and second best groups, consisting of Bull, Cow, 2 Heifers (2 and 3 year old), to be drawn from the regular Sections and the property of Exhibitor, the winner of the first prize not to be entitled to the second—£15 and £10.			
AYRSHIRE.				
25.	Bull of any age . . . . .	15	10	5
	Breeder of best Bull,—The Silver Medal.			
26.	Cow in Milk, of any age . . . . .	10	7	3
27.	Cow in Calf, of any age . . . . .	10	7	3
28.	Heifer calved on or after 1st Jan. 1890 . . . . .	10	7	3
		<hr/>		
		90		
		£612		

## CLASS II.—HORSES.

### FOR AGRICULTURAL PURPOSES.

#### CAWDOR CHALLENGE CUP, VALUE 50 GUINEAS, FOR BEST MARE.

*Conditions of Competition.*—1. These Cups are, through the kindness of the Right Honourable the Earl of Cawdor, President for the year 1891-92, offered by the Clydesdale Horse Society of Great Britain and Ireland—one for the best Clydesdale Stallion or Entire Colt registered in the Clydesdale Stud-Book, and the other for the best Clydesdale Mare or Filly registered in the Clydesdale Stud-Book, entered in any of the Draught Horse classes, at the show or shows at which they may be competed for. 2. The Council of the Clydesdale Horse Society shall, at a meeting held not later than the month of August in any year, decide at what show or shows the "Cawdor Challenge Cups" shall be competed for in the year immediately following. 3. Either of these Cups must be won three times by an exhibitor (but not necessarily in consecutive years or with the same animal) before it becomes his absolute property; and immediately after an award has been made, and official notification thereof has been received by the Secretary of the Clydesdale Horse Society from the Secretary of the Society under whose auspices the competition has taken place, the name of the winner, and of the animal with which the Cup has been won, will be engraven on the Cup. 4. The winner of either of the Cawdor Challenge Cups, other than the absolute winner, shall, before delivery thereof is made to him, give security to the Clydesdale Horse Society that he shall surrender the same to the Society and deliver it at the Society's office when called upon to do so. 5. Until the Cup or Cups be won outright, the winner of either Challenge Cup will receive the Clydesdale Horse Society's Silver Medal as a memento of his winning the Cup; and the said Medal shall bear an inscription specifying the show at which, the date on which, and the name of the animal with which the Challenge Cup has been won, as well as the name of the owner. In name of

<sup>1</sup> Given by Mr Shoolbred of Wyvis.

the Council of the Clydesdale Horse Society, and as approved, first, by its Committee, Messrs R. Sinclair-Scott, John M. Martin, and James Park, and finally, by the Right Hon. the Earl of Cawdor, its President.

ARCHD. MACNEILAGE, *Secretary*.

For the above Cup all former prize animals at the Society's Shows, now disqualified from competing in the ordinary classes, are permitted to compete. The Clydesdale Horse Society to have the option of photographing the winner for publication in the Clydesdale Stud-Book.

Section	Premiums.			
	1st.	2d.	3d.	4th.
	£	£	£	£
1. Stallion foaled before 1st Jan. 1889	15	12	8	4
2. Entire Colt foaled on or after 1st Jan. 1889	15	12	8	4
3. Entire Colt foaled on or after 1st Jan. 1890	15	10	6	3
4. Entire Colt foaled on or after 1st Jan. 1891	12	7	4	2
Best Stallion in the four Sections registered in the Clydesdale Stud-Book,—Champion Premium of £10, 10s. The Council of the Clydesdale Horse Society to have the option of photographing the winner for publication in the Clydesdale Stud-Book. <sup>1</sup>				
Breeder of Best Male Animal of any age in the four Sections,—The Silver Medal.				
5. Mare of any age, with Foal at foot.	15	10	5	3
6. Mare (in Foal) foaled before 1st Jan. 1889	10	6	3	2
7. Filly foaled on or after 1st Jan. 1889	10	6	3	2
8. Filly foaled on or after 1st Jan. 1890	10	6	3	2
9. Filly foaled on or after 1st Jan. 1891	10	6	3	2

£254

Best Mare or Filly registered in the Clydesdale Stud-Book,—Cawdor Challenge Cup, value 50 guineas (see page 75).

	Premiums.		
	1st.	2d.	3d.
	£	£	£
HUNTERS AND ROADSTERS.			
10. Mare or Gelding, suitable for field, foaled before 1st Jan. 1889	10	5	3
11. Mare or Gelding, suitable for field, foaled on or after 1st Jan. 1889	10	5	3

Carry forward 20 10 6 £254

No animal is allowed to compete in more than one Section, except for Jumping.

<sup>1</sup> Given by the Clydesdale Horse Society.

		Brought forward ... .. £254		
		Premiums.		
HUNTERS AND ROADSTERS— <i>contd.</i>		1st.	2d.	3d.
		£	£	£
Section	Brought forward	20	10	6
12.	Mare or Gelding, suitable for field, foaled on or after 1st Jan. 1890 .	8	4	2
13.	Mare or Gelding, suitable as Hackney or Roadster, to be exhibited in saddle only . . . . .	8	4	2
14.	Mare or Gelding, suitable for driving, 3 years old and upwards, to be shown in harness and driven .	8	4	2
15. <sup>1</sup>	Horse or Mare, for jumping .	20	10	5

113

- 16.<sup>2</sup> Mares suitable for Breeding Hunters, in foal to, or with foal at foot by, a thoroughbred Horse,—Four Prizes, £12, £8, £3, £2, and in addition, a Gold Medal, or a Bronze Medal and £5, given by the Hunters' Improvement Society. Mares which have previously been awarded the Hunters' Improvement Society's Medal, and Mares which have previously won a Hunters' Improvement Society's Premium as a Brood Mare, are ineligible for this Medal.

*Instruction.*—In the event of any of the prize mares being disqualified, owing to their having previously won the Hunters' Improvement Society's Medal or Premiums, it shall then be awarded to the next in order, provided she takes one of the prizes or first reserve.

- 17.<sup>3</sup> Yearlings the produce of the Queen's Premium Stallions that have served in Scotland, or any other thoroughbred Stallion stationed in Scotland, out of Mares of any breed,—Five Prizes, £10, £7, £5, £2, £1.

		Premiums.		
PONIES.		1st.	2d.	3d.
		£	£	£
18.	Stallion, 15 hands and under .	4	2	1
19.	Mare or Gelding, between 13 and 14½ hands . . . . .	4	2	1
20.	Mare or Gelding, between 12 and 13 hands . . . . .	4	2	1
21.	Mare or Gelding, under 12 hands .	4	2	1
Carry forward		16	8	4
		£367		

No animal is allowed to compete in more than one Section, except for Jumping.

<sup>1</sup> Animals entered in the other Sections may compete for Jumping. Animals entered for Jumping only do not require to come to the Showyard till Wednesday morning before 8 o'clock.

<sup>2</sup> Given by Mr Gilmour of Montrave.

<sup>3</sup> Given by Captain Clayhills Henderson of Invergowrie.

		Brought forward	...	...	£367
		Premiums.			
PONIES— <i>contd.</i>		1st.	2d.	3d.	
		£	£	£	
Section	Brought forward	16	8	4	
22.	Shetland Stallion, above 3 years, not exceeding 10½ hands	4	2	1	
23.	Shetland Mare or Gelding, above 3 years, not exceeding 10½ hands	4	2	1	
24. <sup>1</sup>	Shetland Stallion, Mare, or Gelding under 3 years, not exceeding 10½ hands, £4, £2, £1.				
<sup>1</sup> Best Shetland Pony in Sections 22, 23, and 24, £3.					
25. <sup>2</sup>	Ponies, 14 hands and under, for jumping	4	2	1	
					49
No animal is allowed to compete in more than one Section, except for Jumping.					£416

## CLASS III.—SHEEP.

		Premiums.			
BLACKFACED.		1st.	2d.	3d.	
		£	£	£	
Section					
1. <sup>3</sup>	Tup three shear or upwards, £5, £3, £1 = £9.				
2.	Tup above one shear	10	5	3	
3.	Shearling Tup	10	5	3	
4. <sup>3</sup>	Five Shearling Tups, bred and fed by Exhibitor, £4, £2, £1 = £7.				
5.	Three Ewes above one shear, with their Lambs at foot	8	4	2	
6. <sup>3</sup>	Tup Lamb, bred and fed by Exhibitor, £3, £2, £1 = £6.				
7.	Three Shearling Ewes or Gimmers	8	4	2	
<sup>3</sup> Sheep (entered in any of the above sections, Male or Female) carrying the fleece best adapted for protecting the animal in a high exposed and stormy climate, £2, £1, 10s. = £3, 10s.					
		36	18	10	
Carry forward					£64

<sup>1</sup> Given by the Shetland Pony Stud-Book Society.<sup>2</sup> Animals entered in the other Sections may compete for Jumping. Animals entered for Jumping only do not require to come to the Showyard till Wednesday morning before 8 o'clock.<sup>3</sup> Given by Mr Howatson of Glenbuck. Animals competing for Mr Howatson's prizes may be drafted from the regular Sections—viz., 2, 3, 5, 7—or may be entered separately in Sections 1, 4, and 6.

		Brought forward ... ..			£64
		Premiums.			
		1st.	2d.	3d.	
		£	£	£	
Section	CHEVIOT.				
8.	Tup above one shear . . . .	10	5	3	
9.	Shearling Tup . . . .	10	5	3	
10.	Three Ewes above one shear, with their Lambs at foot . . . .	8	4	2	
11.	Three Shearling Ewes or Gimmers . . . .	8	4	2	
					64

## BORDER LEICESTER.

Tweeddale Gold Medal for best Tup, £20.

12.	Tup above one shear . . . .	10	5	3	
13.	Shearling Tup . . . .	10	5	3	
14.	Three Ewes above one shear . . . .	8	4	2	
15.	Three Shearling Ewes or Gimmers . . . .	8	4	2	
					64

## SHROPSHIRE.

16.	Tup above one shear . . . .	6	4	2	
17.	Shearling Tup . . . .	6	4	2	
18.	Three Ewes above one shear . . . .	5	3	2	
19.	Three Shearling Ewes or Gimmers . . . .	5	3	2	
					44

## EXTRA SECTIONS.

20.	Three Blackfaced Wethers, one shear	4	2	—	
21.	Three Cheviot Wethers, one shear .	4	2	—	
22. <sup>1</sup>	Three Cross-bred Wethers, one shear	4	2	—	
					18
					£254

## CLASSES I., II., III.—CATTLE, HORSES, AND SHEEP.

<sup>2</sup>Champion Cup, value £50, for the greatest number of points in Classes I., II., and III. (Cattle, Horses, and Sheep). Three points for a first prize; two points for a second prize; one point for a third prize. In the event of a tie, the greatest number of first prizes to carry. The Cup becomes the property of the exhibitor winning most prizes in either one or all of these classes. No Gelding or Wether to count points, nor anything under the class of Extra Stock. All stock must be the *bona fide* property of the exhibitors.

<sup>1</sup> Cross-bred Wethers must be the offspring of any Whitefaced or Short-Woolled Tup with Blackfaced Ewes, or the progeny of Blackfaced Tups with Whitefaced or Short-Woolled Ewes.

<sup>2</sup> Given by Mr Macpherson of Corrimony.



## CLASS V.—POULTRY.

*First Premium* — ONE SOVEREIGN ; *Second Premium* — TEN SHILLINGS ; one Commended Ticket—in all the Sections of Poultry.

Aged Birds must have been hatched previous to, and Cockerels and Pullets in, 1892.

	Section	Section
DORKING— <i>Silver Grey</i>	1. Cock	2. Hen
	3. Cockerel	4. Pullet
DORKING— <i>Coloured</i>	5. Cock	6. Hen
	7. Cockerel	8. Pullet
COCHIN-CHINA	9. Cock	10. Hen
	11. Cockerel	12. Pullet
BRAHMAPOOTRA	13. Cock	14. Hen
	15. Cockerel	16. Pullet
SCOTCH GREY	17. Cock	18. Hen
	19. Cockerel	20. Pullet
HAMBURG	21. Cock	22. Hen
	23. Cockerel	24. Pullet
PLYMOUTH ROCK	25. Cock	26. Hen
	27. Cockerel	28. Pullet
MINORCA	29. Cock	30. Hen
	31. Cockerel	32. Pullet
LEGHORN	33. Cock	34. Hen
	35. Cockerel	36. Pullet
LANGSHAN	37. Cock	38. Hen
	39. Cockerel	40. Pullet
WYANDOTTE	41. Cock	42. Hen
	43. Cockerel	44. Pullet
ANY OTHER PURE BREED	45. Cock	46. Hen
	47. Cockerel	48. Pullet
GAME— <i>Black or Brown Reds</i>	49. Cock	50. Hen
	51. Cockerel	52. Pullet
GAME — <i>Any other Pure Breed</i>	53. Cock	54. Hen
	55. Cockerel	56. Pullet
BANTAMS— <i>Any Pure Breed</i>	57. Cock	58. Hen
	59. Cockerel	60. Pullet
DUCKS— <i>White Aylesbury</i>	61. Drake	62. Duck
	63. Drake (Young)	64. Duckling
DUCKS— <i>Rouen</i>	65. Drake	66. Duck
	67. Drake (Young)	68. Duckling
DUCKS — <i>Any other Pure Breed</i>	69. Drake	70. Duck
	71. Drake (Young)	72. Duckling
TURKEYS— <i>Any Pure Breed</i>	73. Cock	74. Hen
	75. Cock (Poult)	76. Hen (Poult)
GEESE— <i>Any Pure Breed</i>	77. Gander	78. Goose
	79. Gander (Young)	80. Gosling

Amount of Poultry Premiums, £120.



## CLASS VI.—DAIRY PRODUCE.

Section	Premiums.		
	1st.	2d.	3d.
	£	£	£
1. Cured Butter, not less than 28 lb. .	4	2	1
2. Powdered Butter, not less than 7 lb. .	4	2	1
3. Fresh Butter, three 1-lb. rolls .	4	2	1
	<hr/>		
			<u>£21</u>

No Exhibitor to show more than one lot in any Section.

## CLASS VII.—IMPLEMENTS.

No Trials of Implements to be held at this Show.

## GENERAL REGULATIONS FOR COMPETITIVE TRIALS.

1. Implements to be entered with the Secretary on or before 25th May. Received in the Yard on Tuesday, 19th July, and till 5 o'clock on the afternoon of Monday 25th. Exhibited Tuesday, Wednesday, Thursday, and Friday, 26th, 27th, 28th, and 29th July.

2. The price as entered in the Catalogue must be held the same till after the trials are over.

3. Implements must be *bona fide* the manufacture of the exhibitor, and fitted together by him, but portions of the machine or other article exhibited for competition may be purchased from other works. Foreign makers may exhibit through their accredited agents.

4. The Premiums will not be awarded without thorough and exhaustive open and competitive trials.

5. The Directors shall have power to withhold the Prizes where there is not sufficient merit, or to apportion them as they think best.

Reference is made to the General Regulations for the terms on which other Implements and Machines may be exhibited at the Show.

## CLASS VIII.—HIGHLAND INDUSTRIES AND FISHERIES.

*Entries to be made with F. N. MENZIES, Esq., 3 George IV. Bridge, Edinburgh, not later than Monday, 23d May.*

Section	Premiums.	
	1st. £	2d. £
1. Two Plaids, Native Wool, Hand-spun, Home-dyed, and Handloom-woven . . . . .	2	1
2. Web, not less than 25 yards Tweed, Cheviot Wool, Hand-spun, Home-dyed, and Handloom-woven . . . . .	3	1
3. Web, not less than 25 yards Tweed, Black-faced Wool, Hand-spun, Home-dyed, and Handloom-woven . . . . .	3	1
4. Web, 25 yards Tweed, Light Texture, for Ladies' Dresses, Native Wool, Hand-spun, Home-dyed, and Handloom-woven . . . . .	3	1
5. Web Harris Tweed, 25 yards, Home Wool and Manufacture . . . . .	3	1
6. Web, not less than 16 yards, of Shetland Tweed, of Shetland Wool, Hand-spun, Home-dyed, and Handloom-woven . . . . .	3	1
7. Six pair Stocking Hose, Hand-spun, Home-dyed, and Knitted by Exhibitor,—two pair plain Ribbed, two pair Diced Tartan, two pair Fancy . . . . .	3	1
8. Twelve pair Socks of Blackfaced Wool, Hand-spun, Home-dyed, and Knitted by Exhibitor . . . . .	2	1
9. Twelve pair Socks of Cheviot Wool, Hand-spun, Home-dyed, and Knitted by Exhibitor . . . . .	2	1
10. Fine White Shetland Shawl . . . . .	3	2
11. Thick Coloured Shetland Shawl . . . . .	3	2
12. Collection of not less than five Articles, of Native Wool, Hand-spun, Home-dyed, and Knitted by Exhibitor . . . . .	2	1
13. Varieties of Yarn, not less than eight cuts, Hand-spun, Home-dyed, and of Native Wool; 4 cuts of each colour . . . . .	2	1
14. Six pair Stockings, Shop Wool, but Knitted by Exhibitor . . . . .	2	1
		— £52

All Exhibits to be sent to F. N. Menzies, Esq., Showyard, Inverness, not later than Thursday, 21st July.

## ABSTRACT OF PREMIUMS.

## GIVEN BY THE SOCIETY.

1. Cattle . . . . .	£612 0 0
2. Horses . . . . .	416 0 0
3. Sheep . . . . .	254 0 0
4. Swine . . . . .	54 0 0
5. Poultry . . . . .	120 0 0
6. Dairy Produce . . . . .	21 0 0
7. Highland Industries and Fisheries . . . . .	52 0 0
8. Seven Silver Medals to Breeders . . . . .	4 18 0
9. Extra Stock, say . . . . .	100 0 0
	<hr/>
	£1633 18 0

## GIVEN BY

1. Mr Inglis of Newmore . . . . .	£10 0 0
2. Major Lyon Mackenzie of Brae- langwell, and other Shorthorn Breeders . . . . .	10 0 0
3. Mr Macpherson Grant of Drum- duan, Cups, &c. . . . .	124 0 0
4. Mrs Morison Duncan of Naughton . . . . .	10 10 0
5. The Highland Herd-Book Society Cup . . . . .	10 0 0
6. Mr Malcolm of Poltalloch . . . . .	10 0 0
7. Mr Shoolbred of Wyvis . . . . .	25 0 0
8. The Clydesdale Horse Society . . . . .	10 10 0
9. Cawdor Cup . . . . .	52 10 0
10. Mr Gilmour of Montrave . . . . .	25 0 0
11. The Hunters' Improvement Society, Gold Medal . . . . .	5 0 0
12. Captain Clayhills Henderson of Invergowrie . . . . .	25 0 0
13. The Shetland Pony Stud-Book Society . . . . .	10 0 0
14. Mr Howatson of Glenbuck . . . . .	25 10 0
15. Mr Macpherson of Corrimony, Cup . . . . .	50 0 0
16. Tweeddale Gold Medal . . . . .	20 0 0
	<hr/>
	423 0 0
	<hr/>
	£2056 18 0

F. N. MENZIES, *Secretary.*3 GEORGE IV. BRIDGE,  
EDINBURGH, *April 1892.*

# MEMBERS ADMITTED SINCE THE LIST WAS PUBLISHED IN APRIL 1891.

ARRANGED ACCORDING TO SHOW DISTRICTS.

ELECTED 17TH JUNE 1891 AND 20TH JANUARY 1892.

## 1.—GLASGOW DISTRICT.

### ARGYLL.

Admitted

- 1891 Blair, John Simpson, Melfort, Kilmelfort
- 1891 Campbell, Alex. E., Duilletter, Dalmally
- 1891 Gillies, John, Barnacarr, Kilniver, Oban
- 1891 Greenbank, Jonathan C., Gigha, Greenock
- 1891 Lowe, P. R., Toomeran Lodge, Lochbuie, Mull
- 1891 Mackenzie, J. Hugh, Fracadal, Tobermory
- 1892 Stuart, Mrs E., Dalness, Glenetive, Taynult

### AYR.

- 1892 Allan, Alex. Young, Munnoch, Dalry
- 1891 Clark, W. K., Currah Farm, Girvan
- 1891 Fraser, M. P., Blackcraig, New Cumnock
- 1892 Highet, M. G., Portland Street, Kilmarnock
- 1891 Todd, Hugh, Harperland, Dundonald

### LANARK.

- 1891 Brown, John, Hillhead Farm, Airdrie—*Free Life Member*
- 1892 Dippie, Alex. George, 94 West Regent Street, Glasgow
- 1891 Dunlop, Colin, jun., Hutton Bank, Hainilton
- 1891 Laidlaw, John, 98 Dundas Street, S.S., Glasgow
- 1892 Millar, John, Fern Hill, Cathkin, Rutherglen
- 1891 Stein, A. H., of Kirkfield, Lanark
- 1892 Thomson, Seton M., Golfhill, Glasgow

### RENFREW.

- 1891 Speirs, Alex. Archibald, of Elderslie, Houston House, Johnstone
- 1892 Tough, Alex., Clyde Rope Work, Greenock

## 2.—PERTH DISTRICT.

### FIFE.

- 1891 Baxter, John Henry, of Gilston, Largo
- 1891 Craig, William, Urquhart, Dunfermline
- 1892 Finlay, Archibald, Markinch
- 1892 Gibson, A. H., Kirkcaldy—*Free Life Member*
- 1891 Husband, Robt., Solicitor, Dunfermline
- 1891 Inglis, James, Redhouse, Cardenden, R.S.O.
- 1891 Lawson, Alex., yr. of Burnturk, Annfield, Kettle
- 1892 Orchison, Alex., of Torr, Cupar-Fife
- 1892 Rosslyn, The Earl of, Dysart House, Kirkcaldy
- 1892 Stewart, Hugh, Lumphinnans, Cowdenbeath
- 1891 Storrar, Richard, Pyestone, Markinch
- 1892 Walker, James L., Banker, Auchtermuchty
- 1891 Walls, Donald M., Grain Merchant, Dunfermline
- 1892 Wardlaw, John, Tough Mill, Dunfermline
- 1892 Wilson, Daniel, Reedieles, Auchtermuchty

### FORFAR.

(WESTERN DIVISION.)

- 1891 Murray, Joseph, Dryburgh, Loches, Dundee

### PERTH.

(EASTERN DIVISION.)

- 1892 Campbell, Alex., Borland, Fernan, Killin
- 1892 Fotheringham, Walter Stewart, of Fotheringham and Murthly
- 1892 Mackenzie, Mark, 36 West Princes St., Perth
- 1892 McNaughton, Alex., Manufacturer, Pitlochry
- 1892 Paterson, Chas. J. G., of Castle Huntly, Longforgan
- 1891 Pitcaithly, Geo., Rhind, Bridge of Earn
- 1892 Ritchie, George, of Hill of Ruthven, King's Place, Perth
- 1892 Robertson, Colonel John Leslie, of Butterglen, C.B., Dunkeld
- 1891 Stevens, A. B., Mains of Kilgraston, Bridge of Earn—*Free Life Member*
- 1892 Whitson, W., Isla Park, Coupar-Augus

## 3.—STIRLING DISTRICT.

## CLACKMANNAN.

- 1891 Cairns, John, Dollarbank, Dollar  
 1891 Clarke, John, Meadowhill, Clackmannan  
 1892 Dobie, W. H., of Dollarbeg, Dollar  
 1891 M'Laren, William, Longcarse, Alloa

## DUMBARTONSHIRE.

- 1892 Douglas, John, Braes o' Yettis, Kirkintilloch

## PERTH.

(WESTERN DIVISION.)

- 1891 Macfarlane, Chas., East Brackland, Calander

## STIRLING.

- 1891 Cairns, William, Burnside, Alva  
 1891 Drysdale, John, Fairfield, Kippen  
 1891 Gray, James, jun., Birkenwood, Gargun-  
 nock  
 1891 Inglis, Robt., Patrickstone, Gargun-  
 nock  
 1891 Macfarlane, James, Oxhill, Bucklyvie  
 1891 Macfarlane, Parlance, Darnley House,  
 Queen's Road, Stirling  
 1891 M'Keich, William, Woodend, Bucklyvie  
 1891 M'Kerracher, Daniel, Raploch, Stirling  
 1891 M'Laren, James, Bandedeath, Stirling  
 1891 Paul, Walter, Laighpark, Milngavie  
 1891 Rawding, George, Bridgehaugh, Stirling  
 1891 Steel, Matthew Taylor, Mineval Villa,  
 Stirling  
 1891 Yellowlees, Robert, Provost of Stirling

## 4.—EDINBURGH DISTRICT.

## EDINBURGH.

- 1892 Brown, Robert, Hillhouse, Kirknewton  
 1892 Buchanan, Charles, Land Steward, Peni-  
 cuik  
 1892 Cox, Robert, of Gorgie, 34 Drumsheugh  
 Gardens  
 1892 Elder, Samuel, Whitehill Mains, Mussel-  
 burgh  
 1892 M'Kinnon, George, Melville Castle, Lass-  
 wade  
 1892 MacLagan, Philip R. D., 14 Belgrave Pl.  
 1892 MacLennan, Wm., Prestonhall Estate  
 Office, Ford, Dalkeith  
 1891 Munro, Duncan, 3 Dalrymple Place—*Free*  
*Life Member*  
 1892 Wilson, John Hardie, D.Sc., F.R.S.E.,  
 Royal Botanic Gardens—*Free Life*  
*Member*

## HADDINGTON.

- 1892 Baillie, Wm., Nurseries, Haddington—  
*Free Life Member*  
 1892 Blair, Thomas, Hoprig Mains, Macmerry  
 1891 Crosbie, Alexander, Blegbie, Humble  
 1892 Haldane, Frederick, Phantassie, Pres-  
 tonkirk  
 1892 Inglis, Alex., Tyninghame, Prestonkirk  
 —*Free Life Member*

## LINLITHGOW.

- 1892 Hutchison, Thomas, of Carlowrie, Kirk-  
 liston

## 5.—ABERDEEN DISTRICT.

## ABERDEEN.

- 1891 Copland, Robt., Milton Ardlethen, Ellon  
 1892 Fraser, Wm. N., of Findrack, Torphins  
 1892 Huggan, John A., 35 Market St., Aber-  
 deen  
 1891 M'Robbie, John S., Sunnyside, Aberdeen

## BANFF.

- 1891 Simpson, Wm., Douglasbrae Manure  
 Works, Keith

## FORFAR.

(EASTERN DIVISION.)

- 1891 Cruikshank, A. W., of Langley Park,  
 Montrose  
 1892 Stephen, David K., Commieston, Montrose

## KINCARDINE.

- 1892 Barrie, James, Butcher, Stonehaven  
 1892 Cowie, James, Westfield, Stonehaven  
 1891 Murray, John, The Muir, Laurencekirk  
 —*Free Life Member*  
 1892 Walker, Robt. W., Portlethen, Aberdeen

## 6.—DUMFRIES DISTRICT.

## DUMFRIES.

- 1892 Dalgleish, James Smith, Auctioneer,  
 Lockerbie  
 1891 Halliday, James, Sliencairn, Annan  
 1892 Kirkpatrick, Andrew, Auchengibbert,  
 Crocketford, Dumfries  
 1891 Murray, Archd., Corsehill Quarries An-  
 nan  
 1891 Young, John, Moffat

## WIGTOWN.

- 1892 M'Clean, James, Auchneal, Stranraer  
 1891 Murray, Alexander, Kilfillan, Glenluce  
 1892 Stewart, Major-General the Hon Alex.,  
 of Corsbie, Newton-Stewart

## 7.—INVERNESS DISTRICT.

## CAITHNESS.

- 1892 Innes, Donald, Sandside, Thurso  
1892 Sinclair, Alex., Quoys of Reiss, Wick

## ELGIN.

- 1892 Malcolm, John, Glenferness, Dunphail

## INVERNESS.

- 1892 Birnie, John, Balnafetack, Inverness  
1892 Boyd, Donald, Merchant, Fort-William  
1892 Cameron, James T., Tallisker, Skye  
1891 Cameron, John, Culreach Mains, Nethy Bridge, R.S.O.  
1892 Davidson, Thos. M., Daltullich, Daviot, Inverness

## NAIRN.

- 1891 Clark, James, Golford, Nairn  
1891 Fiddes, George, Drumduan, Nairn  
1891 Gowans, Charles, Newton, Cawdor  
1891 M'Lennan, Alex., Drumore, Nairn  
1891 M'Lennan, James, Fornightly, Nairn  
1891 Malcolm, William, Househill, Nairn  
1891 Methven, Edward W., Heathmount, Nairn

## ORKNEY AND SHETLAND.

- 1892 Edmonston, Laurence, Hallegarth, Baltasound, Lerwick  
1892 Ganson, Robert D., Lerwick  
1892 Meiklejohn, John J. B., Bressay, Lerwick  
1892 Pottinger, Sinclair, Grimsta, Lerwick

## ROSS.

- 1892 Bignold, Arthur, of Loch Rosque, Achnasheen  
1892 Duncan, William J., Solicitor, Dingwall  
1892 Garrioch, John T., Lovat Estates Office, Beaulieu  
1891 Grant, Peter, Factor, Fortrose  
1892 Macdonald, Alex., Balnagown, Parkhill, Ross-shire  
1892 Mackenzie, Sir A. G. Ramsay, of Coul, Bart., Strathpeffer  
1892 Mackintosh, D., Auction Mart, Dingwall  
1892 Munro, Stuart C., of Teanarick, Alness  
1892 Ross, Lady, of Balnagown, Parkhill  
1892 Scott, James, Seafeld, Portmahomack  
1892 Shoolbred, Walter, of Wyvis, Evanton  
1892 Stewart, William, Alness Ferry, Resolis, Invergordon  
1892 Wilson, Hugh, Milton of North Rhynie, Rhynie

## SUTHERLAND.

- 1892 Gilchrist, John R., of Ospisdale, Dornoch

## 8.—BORDER DISTRICT.

## BERWICK.

- 1891 Dodds, Robert, Blackadder Bank, Chirnside  
1891 Fleet, W. J., Marchmont, Duns—*Free Life Member*  
1892 Hogg, Robt., Fireburn Mill, Coldstream  
1891 M'Donald, Dan., Hawkshaw, Coldstream  
1892 Menzies, John C., Bankhead, Duns—*Free Life Member*  
1892 Robertson, William, Blinkbonny, Earlstoun—*Free Life Member*

## ROXBURGH.

- 1892 Hay, Athole S., of Marfield, Roxburgh

## SELKIRK.

- 1891 Cairns, Thomas Munro, Ramsaycleuch, Selkirk

## ENGLAND.

- 1891 Coward, J. A., Eden Town, Carlisle—*Free Life Member*  
1891 Forbes, A. C., Farnham Royal, Slough, Bucks—*Free Life Member*  
1891 Irving, Robert Jas., Blackhole House, Carlisle—*Free Life Member*  
1891 Lister, Joseph, Little Broughton, Carlisle—*Free Life Member*

- 1891 Menzies, Robert, Haverland, Norwich  
1892 Noel, Ernest, Lydhurst, Haywards Heath, Sussex  
1892 Rand, John, Fordhill House, Cornhill-on-Tweed  
1891 Townley-Parker, T. Townley, Cuerdon Hall, Bamber Bridge, Preston  
1891 White, W. E. C., Elsham Brigg, Lincolnshire—*Free Life Member*

## IRELAND.

- 1892 Kennedy, Samuel, Elmgrove, Belfast



# INDEX.

- Abortion in Cows: Report to General Meeting, Appendix A, 21.
- Accounts. *See* Finance.
- Agricultural Bursaries: Reports to Board and General Meetings, Appendix A, 8, 31—Bye-Laws, Appendix B, 12—Regulations and Examination Papers for 1891, Appendix B, 16.
- Agricultural Class in Edinburgh University, Prizes awarded to Students, Appendix A, 67.
- Agricultural Education: Report of Examinations for 1891, Appendix A, 3, 20, 31—Board recommend to Council that, as far as practicable, the teaching element should be eliminated from the Examining Board, Appendix A, 3, 21—Council, Board of Examiners, Bye-Laws, Syllabus of Examination, and Examination Papers for 1891, Appendix B, 11.
- Agricultural Statistics of Scotland, 206.
- Agriculture, Board of, Scottish Representative on, Proceedings in regard to, Appendix A, 10, 12, 29.
- Aitken, Dr A. F., Chemist to the Society: Pumpherston Experimental Station, Grass Crop, 1891, 224—Botanical Analyses of Fourth Year's Grass, 226—Feeding Experiments to determine the relative value as Fodder of Ryegrass, eaten green and after being made into Hay, 240—Manurial Experiments throughout Scotland: (Experiment VIII.) The most Economical Turnip Manure, 255—(Experiment VI.) The most Economical Turnip Manure, Early *versus* Late Manuring, &c., 272—(Experiment IX.) Soluble Nitrogenous Manures, and the time to apply them, 275—Analytical Associations, Report for 1891, Deficient Manures, 287—Experiments to prevent Potato Disease with Bordeaux Spray, 292—with Sulphate of Copper and Lime, by John Speir, 298—Reports to General Meetings, Appendix A, 19, 32.
- American Chilled Plough in comparison with the Scotch Swing Plough, by John Barclay, 33.
- Analytical Associations, Report for 1891, Deficient Manures, Method of Procedure to be followed in applying for Grants, Appendix B, 30—Grants to, Appendix B, 39.
- Argyll Naval Fund, Statement regarding, at General Meeting, Appendix A, 27—Accounts for 1890-91, Appendix A, 73.
- Barclay, John: The American Chilled Plough in comparison with the Scotch Swing Plough, 33.
- Barley, Price of Home-Grown, in the Edinburgh Market, for 1891, 214.
- Barr, James, junr.: Cultivation and Marketing of Strawberries in Clydesdale, 135.
- Beans, Price of Home-Grown, in the Edinburgh Market for 1891, 214.
- Bee Husbandry, Appendix A, 1.
- Botanical Department: Botanical Investigation of the Old Pastures of Scotland, by A. N. M'Alpine, 10—Reports by Botanist to General Meetings, Appendix A, 20, 32—Scale of Charges and Instructions for selecting and sending Samples, Appendix B, 43.
- Breeding of Dairy Stock, Appendix A, 1.
- Buchan, Dr Alexander: Meteorology of 1891, 128.
- Bursaries. *See* Agricultural Bursaries.
- Bye-Laws, Proposed new, Appendix A, 6, 8, 18, 26.
- Campbell, Admiral: Stack Ensilage, 162.
- Cattle-Feeding, by John Hart, 191.
- Cattle-Feeding Experiments with and without Spices, by John Milne, 154.
- Cattle, Movement of, Exhibited at Royal Dublin Society's Show, Appendix A, 7, 17.
- Cereal and other Crops of Scotland for 1891, and Meteorology of the Year relative thereto, 107—Average produce of Cereal and other Crops, 207.
- Chemical Department: Reports by Dr A. P. Aitken, Chemist to the Society; Pumpherston Experimental Station, Grass Crop, 1891, 224—Botanical



- Analyses of Fourth Year's Grass, 226  
 —Feeding Experiments to determine the relative value as Fodder of Ryegrass eaten green and after being made into Hay, 240—Manurial Experiments throughout Scotland: (Experiment VIII.) The most Economical Turnip Manure, 255—(Experiment VI.) The most Economical Turnip Manure, Early *versus* Late Manuring, &c., 272.—(Experiment IX.) Soluble Nitrogenous Manures, and the time to apply them, 275—Analytical Associations, Report for 1891, Deficient Manures, 287—Experiments to prevent Potato Disease with Bordeaux Spray, 292—with Sulphate of Copper and Lime, by John Speir, 298—Reports to General Meetings, Appendix A, 19, 32—Members' privileges in respect of Analyses, Appendix B, 27—Instructions for selecting samples for Analyses, Appendix B, 28—Local Analytical Associations, Appendix B, 29—Procedure to be followed in applying for Grants, Appendix B, 30.
- Chilled (The American) Plough in comparison with the Scotch Swing Plough, by John Barclay, 33.
- Clarence and Avondale, Duke of, Votes of Condolence on his death, to the Queen, Appendix A, 25—To the Prince of Wales, 25—To Princess Victoria Mary of Teck, 25.
- Clydesdale, Cultivation and Marketing of Strawberries in, by James Barr, junr., 135.
- Cottage and Garden Competitions: Report to General Meeting, Appendix A, 33—Premiums awarded in 1891, Appendix A, 67—Premiums offered in 1892, Appendix B, 58.
- Crichton, Hew, S.S.C., Death of, Appendix A, 7.
- Cultivation and Marketing of Strawberries in Clydesdale, by James Barr, junr., 135.
- Dairy Department: Examination of Pupils from Dairy Schools, Appendix A, 1, 4, 6, 18—Grants, Appendix A, 11—Report to General Meeting, Appendix A, 33—Objects of, Appendix B, 44—Grants to Associations, Appendix B, 44.
- Directors, Nomination of, by Show Districts, Appendix A, 6.
- Directors and other Office-Bearers for 1892, Appendix B, 5.
- District Competitions, Report to General Meeting, Appendix A, 33—Premiums awarded in 1891, Appendix A, 63—Premiums offered in 1892, Appendix B, 51.
- Dublin Show, Cattle Exhibited at, Appendix A, 7, 17.
- Duncan, Thomas, Clerk to the Society, Resignation of, Appendix A, 12, 26.
- Dykes, Thomas: Permanent Timothy-Grass Meadows, 1.
- Ensilage, Stack, by Admiral Campbell, 162.
- Essays and Reports, Premiums awarded for, in 1891, Appendix A, 42—Premiums offered for, in 1892, Appendix B, 46.
- Establishment for 1892, Appendix B, 5.
- Examiners in Agricultural Education, Appendix B, 11—Forestry Department, Appendix B, 22.
- Farm (on Produce) Rents, by T. W. Lorimer, 36.
- Feeding and Management of Work-horses, by Arch. MacNeillage, 167.
- Feeding Cattle, by John Hart, 191.
- Feeding Cattle, Experiments with and without Spices, by John Milne, 154.
- Feeding Experiments to determine the relative value as Fodder of Ryegrass eaten green and after being made into Hay, 240.
- Field Mice or Voles, Plague of, Appendix A, 14, 15, 34.
- Finance: State of the Funds of the Society at 30th November 1891, Appendix A, 69—View of the Income and Expenditure for Year 1890-91, Appendix A, 72—Abstract of the Accounts for 1890-91, Appendix A, 70—Abstract of the Accounts of the Stirling Show, 1891, Appendix A, 74—Abstract of the Accounts of the Argyll Naval Fund for 1890-91, Appendix A, 73.
- Findlay, T. D., of Easterhill, Death of, Appendix A, 5.
- Fines for non-exhibition of Live Stock, Discussion at Stirling, Appendix A, 22.
- Forestry Department: Report of Examinations, Appendix A, 21, 31—Colonel Bailey, R.E., appointed Lecturer on Forestry in Edinburgh University, Appendix A, 31—Board of Examiners, Syllabus of Examination and Examination Papers, 1891, Appendix B, 22.
- Forestry: Old and Remarkable Holly Trees in Scotland, by Robert Hutchison, 80—Utilisation of Waste Produce of Forests and Woodlands, by A. D. Webster, 95.
- Forestry, Proposed Chair of, Appendix A, 9, 11, 18.
- Free Life Members elected, Appendix A, 16.
- Glanders, Letter from Mr Hunting, V.S., London, on stamping out, Appendix A, 15.
- Government Grant for Experiments, Appendix A, 4, 6, 8, 18.
- Grass Meadows, Permanent Timothy, by Thomas Dykes, 1.
- Hamilton, Hon. Robert Baillie, of Langton, Death of, Appendix A, 8.
- Hart, John: Cattle Feeding, 191.
- Highland and Agricultural Society, Proceedings at Board and General Meetings, Appendix A, 1—Constitution and

- Management, Appendix B, 4—Establishment for 1892, Appendix B, 5—Meetings for 1892, Appendix B, 7—Committees for 1892, Appendix B, 8.
- Highland Industries and Fisheries: Prizes offered, Appendix B, 83.
- Hollies, Old and Remarkable, in Scotland, by Robert Hutchison, 80.
- Horses, Feeding and Management of Work, by Arch. MacNeillage, 167.
- Hutchison, Robert: Old and Remarkable Hollies in Scotland, 80.
- Imperial Institute, The Duke of Montrose appointed the Society's representative, Appendix A, 7.
- Implements, Committee to inspect, Exhibition in yard, Appendix A, 9.
- Inglis, Right Hon. John, of Glencorse, Lord Justice-General, Death of, Appendix A, 8.
- Inverness Show, 1892, Proceedings in regard to, Appendix A, 9, 10, 13, 18, 24, 28—Premiums offered, Appendix B, 63.
- Irish Ram Breeding Society, Regulation by, as to colouring wool, Appendix A, 8.
- Lorimer, T. W.: On Produce Farm Rents, 36.
- M'Alpine, A. N.: Botanical Investigation of the Old Pastures of Scotland, 10—Reports on Botanical Department to General Meetings, Appendix A, 20, 32.
- Macdougall, Mr., Treatment of Pleuro-Pneumonia by, Appendix A, 14, 15.
- MacGregor, John, Ladywell, Death of, Appendix A, 13.
- MacNeillage, Arch.: Feeding and Management of Work-Horses, 167.
- Manurial Experiments: The most Economical Turnip Manure, 255—Early *versus* Late Manuring, 272—Soluble Nitrogenous Manures, and the time to apply them, 275.
- Meadows, Permanent Timothy-Grass, by Thomas Dykes, 1.
- Mechanical Milking Apparatus, a Season's Experience of a, by John Speir, 19.
- Meteorology of 1891, by Dr Alexander Buchan, 128.
- Mice, Plague of Field, or Voles, Appendix A, 14, 15, 34.
- Milking Apparatus, a Season's Experience of a Mechanical, by John Speir, 19.
- Milne, John: Cattle-Feeding Experiments with and without Spices, 154.
- Montrose, Duke of, Vote of Thanks to, on Retiring from Office of President, Appendix A, 26.
- Moray, C. S. Home Drummond, of Blair-drummond, Death of, Appendix A, 8.
- Munro, John, of Kinloss, Death of, Appendix A, 10.
- Murray, T. G., W.S., Death of, Appendix A, 3.
- New Members, Committee appointed to procure, Appendix A, 2, 5—Admitted since the List was published in April 1891, Appendix B, 85.
- Nomination of Directors by Show Districts, Appendix A, 6—Dates of Meetings for, Appendix B, 7.
- Oats, Price of Home-Grown, in the Edinburgh Market for 1891, 214.
- Office-Bearers of the Society for 1892, Committee to prepare List of, Appendix A, 9—Election of, Appendix A, 25—List of, Appendix B, 5.
- Old and Remarkable Hollies in Scotland, by Robert Hutchison, 80.
- Overfeeding of Stock for Shows, Committee appointed to consider, Appendix A, 7.
- Pasture Plants, by John B. Webster, 49.
- Pastures of Scotland, Botanical Investigation of the, by A. N. M'Alpine, 10.
- Permanent Timothy-Grass Meadows, by Thomas Dykes, 1.
- Plague of Mice or Voles, Appendix A, 34.
- Pleuro-Pneumonia, Appendix A, 14—Treatment of, by Mr Macdougall, Southport, Appendix A, 14, 15.
- Pleuro-Pneumonia in Ireland, Appendix A, 7, 10, 17.
- Ploughing Competitions held in 1891-92, Appendix A, 67—Regulations for, Appendix B, 57.
- Potato Disease, Experiments with Bordeaux Spray to prevent, by Dr A. P. Aitken, 292—Experiments with Sulphate of Copper and Lime, by John Speir, 298—Committee appointed, at request of Board of Agriculture, to conduct Experiments, Appendix A, 7, 11, 13, 18, 32.
- Premiums awarded in 1891, Appendix A, 42—offered in 1892, Appendix B, 45.
- Prices of Sheep and Wool since 1818, 221.
- Proceedings at Board and General Meetings, Appendix A, 1.
- Produce Farm Rents, by T. W. Lorimer, 36.
- Queen, Vote of Condolence to her Majesty the, on the Death of the Duke of Clarence and Avondale, Appendix A, 25.
- Rents, on Produce Farm, by T. W. Lorimer, 36.
- Scotch Swing Plough, the American Chilled Plough in comparison with the, by John Barclay, 33.
- Scottish Representative on Board of Agriculture, Appendix A, 10, 12, 29.
- Sheep, Prices of, since 1818, 221.
- Showyard Expenditure, appointment of Committee, Appendix A, 10.
- Showyard Meeting at Stirling, Appendix A, 16.
- Speir, John: a Season's Experience of a Mechanical Milking Apparatus, 19—Experiments to prevent Potato Disease by Sulphate of Copper and Lime, 298.

- Spices, Cattle-feeding Experiments with and without, by John Milne, 154.
- Stack Ensilage, by Admiral Campbell, 162.
- Statistics (Agricultural) of Scotland, 206.
- Stirling Agricultural Society, Resolution to hold their Show in 1891, Appendix A, 2, 5.
- Stirling Show, 1891, Report on, 68—Proceedings in regard to, Appendix A, 2, 4, 5, 6, 7, 9, 16, 21—Discussion on Loss at Show, Appendix A, 27—Premiums awarded, Appendix A, 42—List of Judges and Attending Members, Appendix A, 61—Abstract of Accounts, Appendix A, 74.
- Stock for Shows, Overfeeding of, Committee named to consider, Appendix A, 7.
- Strawberries, Cultivation and Marketing of, in Clydesdale, by James Barr, junr., 135.
- Technical Education, Committee appointed to consider Government Grant, Appendix A, 2—Queries and Opinion of Council, Appendix A, 3, 6—Report to General Meeting, Appendix A, 19.
- Teck, Princess Victoria-Mary of, Letter from, acknowledging Vote of Condolence on the Death of the Duke of Clarence, Appendix A, 14—Address, Appendix A, 25.
- Timothy (permanent) Grass Meadows, by Thomas Dykes, 1.
- Transference of Members' Tickets at Stirling Show, Appendix A, 9.
- Utilisation of Waste Produce of Forests and Woodlands, by A. D. Webster, 95.
- Veterinary Department: Inquiry into Abortion in Animals, Appendix A, 21—Medals awarded to Students, Appendix A, 67—Note regarding the Institution of, Appendix B, 22.
- Voles, or Field Mice, Plague of, Appendix A, 14, 15, 34.
- Wales, His Royal Highness the Prince of, Vote of Condolence to, on the Death of the Duke of Clarence and Avondale, Appendix A, 25.
- Webster, A. D.: Utilisation of Waste Produce of Forests and Woodlands, 95.
- Webster, John B.: Pasture Plants, 49.
- Wheat, Price of Home-Grown, in the Edinburgh Market for 1891, 214.
- Wilson, John, Wellnage, Death of, Appendix A, 6.
- Wool, Prices of, since 1818, 223.
- Work-Horses, Feeding and Management of, by Arch. MacNeillage, 167.





I. A. R. I. 75.

IMPERIAL AGRICULTURAL RESEARCH  
INSTITUTE LIBRARY  
NEW DELHI.

Date of issue. | Date of issue. Date of issue.